...st, 1957 ...TECHNOLOGY DEPT. TWO SHILLINGS & SIXPENCE

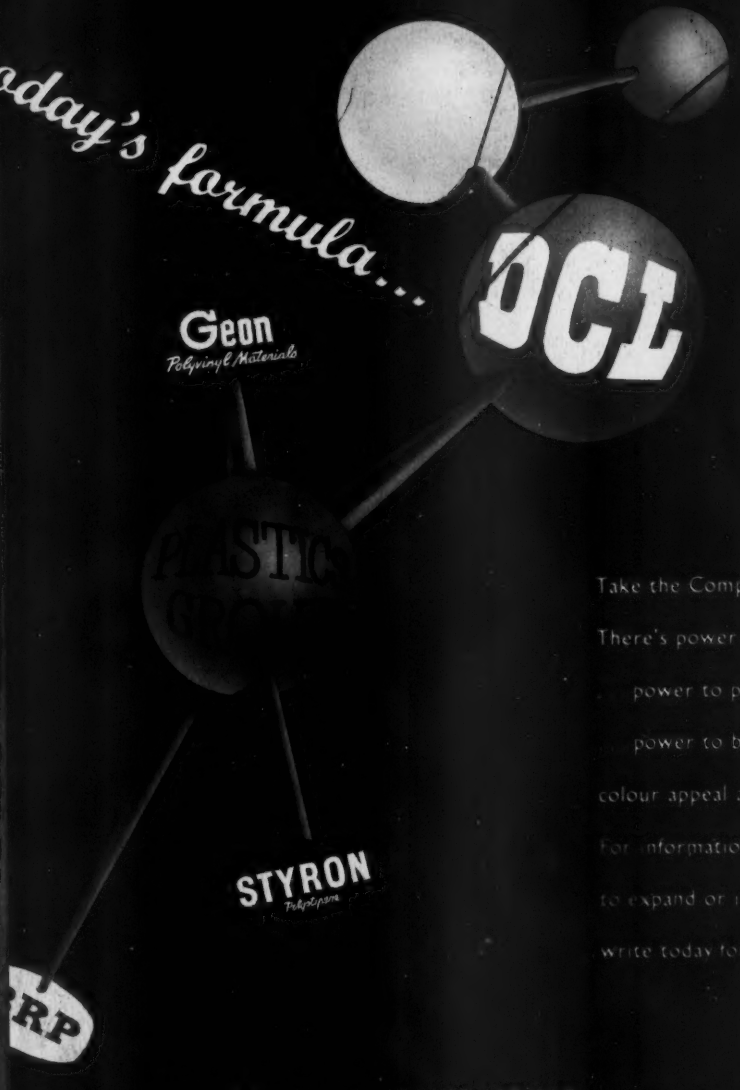
Plastics

EXHIBITION REPORT

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

AUG 27 1957
DETROIT

...oday's formula...

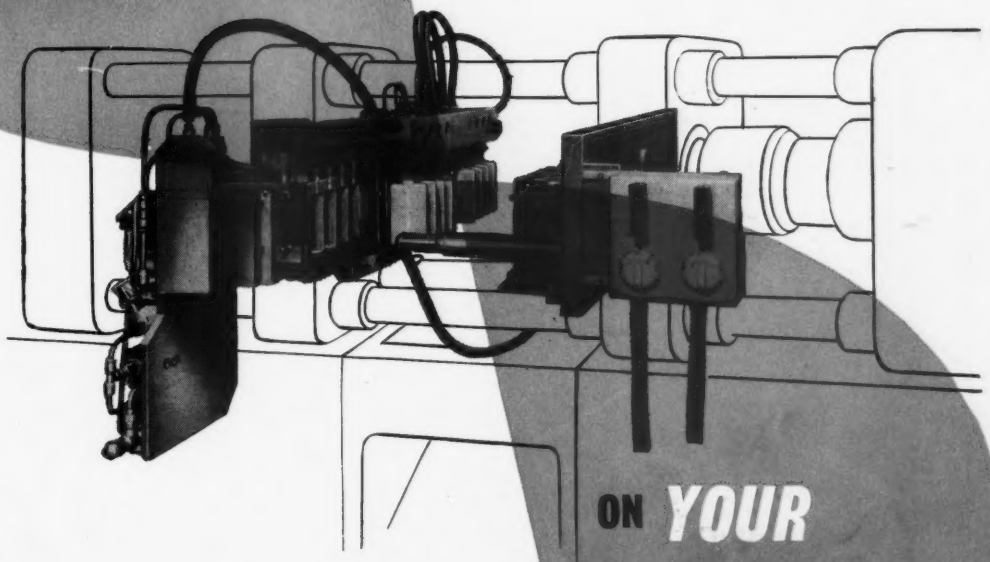


Take the Companies that form the Distillers Plastics Group
There's power in the combination...
power to pioneer new plastics materials
power to bring to every industry the lightness, strength, colour appeal and all the other great advantages of plastics.
For information on how the three companies can help you to expand or improve the use of plastics in your industry, write today for Booklet FP

BRITISH RESIN PRODUCTS LIMITED
BRITISH GEON LIMITED
DISTRENE LIMITED

Distillers Plastics Group
Head Office: Devonshire House, Piccadilly, London W.1
Telephone: MAYfair 8867

AUTOMATIC BLOW MOULDING



ON YOUR STANDARD INJECTION MOULDING MACHINE

It is now possible to purchase automatic special blow moulding plant! Simply adapt your standard injection moulding machine with the new, amazingly efficient Granbull Blow Moulding Unit . . . and open up fresh sources of profitable production. Designed for multi-impression work with 'push-button' speed and precision, to the maximum capacity of your machine. Write for full technical details.

OUR MANUALLY OPERATED EQUIPMENT ALREADY USED BY MANY MOULDING COMPANIES IS SUITABLE FOR FITTING TO STANDARD MOULDING MACHINES

Agents in principal countries

CTA MEMBER

THE GRANBULL TOOL CO. LTD

Registered Office and Works

39 HIGH STREET • KINGSTON-ON-THAMES • Tel: KINGSTON 3322

LANKRO PLASTICISERS

PHTHALATES: DBP. DAP 79.
DNP. DIOP. DOP. DCP.
LANKROFLEX 29.

SEBACATES: DOS. DAS 79.
DIOS.

SPECIALITY PLASTICISERS:
BAR. LANKROFLEX ED 3.

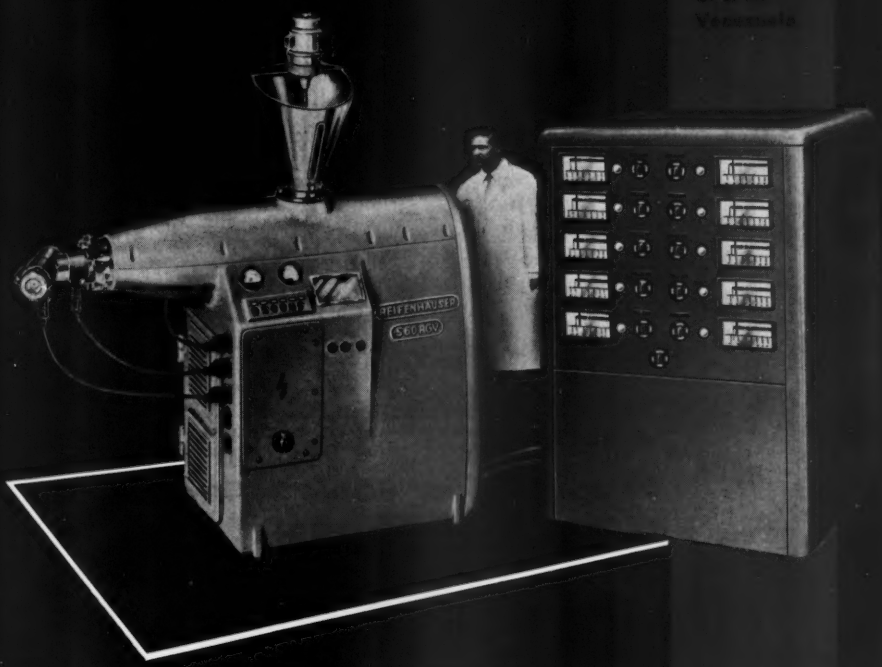
STABILISERS.

LANKRO CHEMICALS LTD., ECCLES, MANCHESTER, TEL. ECCLES 5311-5316

Installed in:
Argentina
Australia
Austria
Belgium
Belg. Congo
Brazil
Bulgaria
Canada
China
Denmark
Egypt
Finland
France
Gr. Britain
Greece
Holland
India
Indonesia
Iran
Israel
Iceland
Italy
Japan
Jordan
Norway
Pakistan
Poland
Portugal
Rumania
Sweden
Switzerland
Spain
South-Africa
Turkey
Uruguay
U. S. A.
Venezuela

the world-wide plastics industry reports to

Reifenhäuser-Extruders



Sole British Agent:
ED. BRAND LTD.,
9, St. Cross Street, Hatton Garden, London, E.C.1
Telephone: Chancery 4091 (3 lines)
Telegrams: Wyrellous, London

A·Reifenhäuser
MASCHINENBAU
TROISDORF · WEST. GERMANY

TELEGRAMS & CABLES:
GERATOLE, LONDON.
CODE: BENTLEY'S SECOND.

TELEPHONE:
ABBEY 3061
(10 LINES)

R. H. COLE & COMPANY LTD

2, CAXTON STREET
WESTMINSTER
LONDON, S.W.1

DIRECTORS:
R. HUGH COLE
W. H. WILES
G. W. BROWN
PETER H. COLE
F. L. THURSTON-MOON

OUR REF DJT/SDF.
YOUR REF 476/3.

Dear Sirs,

It is with pleasure that we acknowledge your request for further information regarding our "Comprehensive Service" - a new trouble free method for plastics Raw Material purchasing which you will find can [illegible] Within the [illegible] materials on [illegible] your [illegible] our [illegible]

This Letter will introduce the R.H.COLE "Comprehensive Service" to YOU!

To :— **R. H. COLE & CO. LTD.**
2 CAXTON STREET, WESTMINSTER, LONDON, S.W.1

Please send me details of your "COMPREHENSIVE SERVICE."

Name :— .....

Address :— .....

.....

P8

Still in the Middle Ages?

High pressure air storage sphere for jet aircraft

Or laminating with **Epikote Resins?**

Epikote Resins, developed by Shell, have opened up new applications for glass-fibre laminates in many fields — tanks, piping, ducts, for instance — where hitherto the use of more conventional materials was the rule. These laminates have high tensile and flexural strengths, excellent fatigue resistance and an all-round chemical resistance. They are light and have a high degree of dimensional stability. Keep up-to-date on Epikote Resins for these and other developments.

SHELL

SHELL CHEMICAL COMPANY LIMITED, Marlborough House, 15/17 Great Marlborough Street, London, W.1.
Tel. GERrard 0666.

"EPIKOTE" *is a Registered Trade Mark.*

Melamine in paint
makes a better finish.

Marvellous Melamine!

Melamine in
moulding powders
for to-day's tableware.

Melamine crystals

British Oxygen Chemicals supply Melamine to makers of resins and moulding powders for–

TABLEWARE
DECORATIVE LAMINATES
FABRICS · PAINTS
PAPERMAKING

BRITISH OXYGEN CHEMICALS

BRIDGEWATER HOUSE, ST. JAMES'S, LONDON, S.W.1. TEL: WHITEHALL 9777

Clifford Covering

THE constantly increasing range of large Injection Mouldings in domestic applications continues to fascinate.

Clifford Covering are specialists in the manufacture of these in large quantities.

CLIFFORD COVERING COMPANY, LTD.

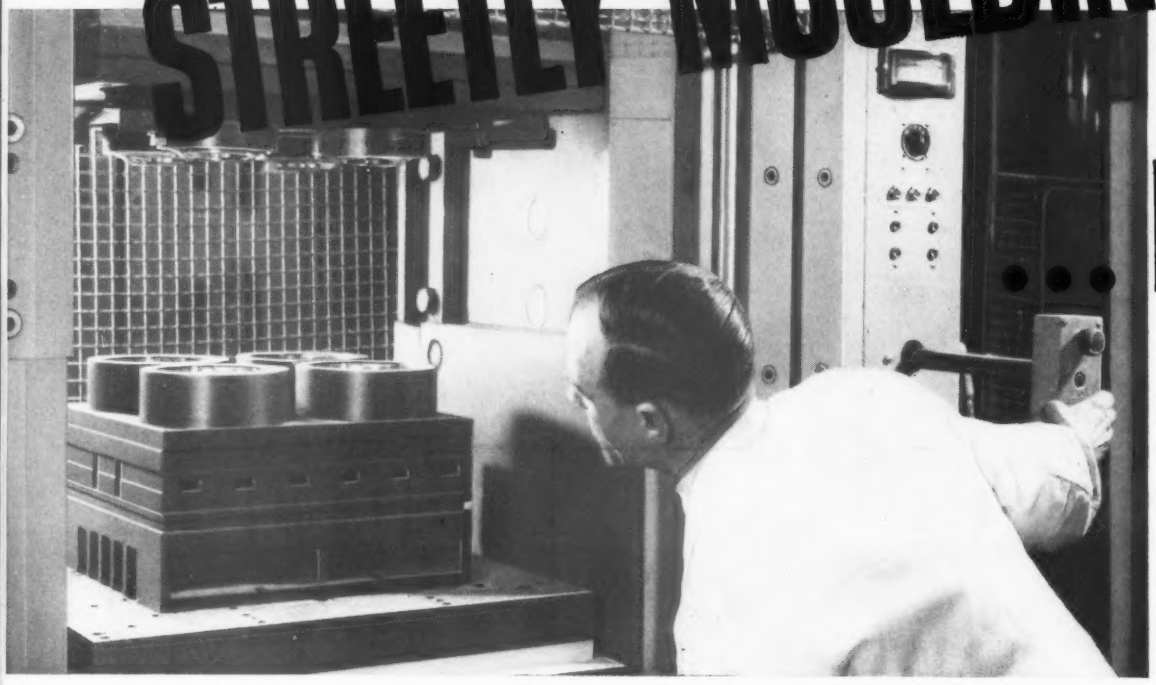
Wharfdale Road, Tyseley, Birmingham, 11

Tel.: ACOcks Green 3941/2/3

A member of the Clifford Group of Companies

WhitsAd 3785

STREETLY MOULDINGS

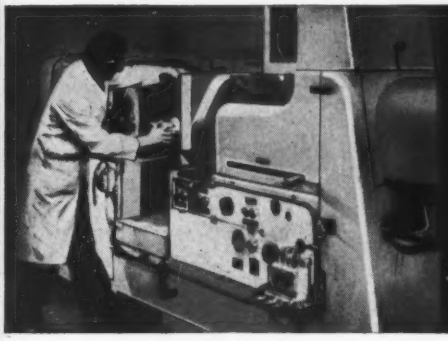


best i

The Streetly success story stems from the skill of our engineers and technicians, the consistency of quality and high productivity of BIPEL presses; and the versatility of our equipment.

Streetly service enables the customer to obtain from a single reliable source both thermosetting and thermoplastic moulded components. On the compression side, we are now completely equipped with BIPEL presses—the key to mass-production of quality mouldings.

Reliability of deliveries in terms of quality, quantity and time has always been our special concern. That this represents solid achievement, and not a mere claim, is implicit in the status of our customers and the long periods during which we have consistently served them.



INJECTION MOULDING

A typical press in our injection moulding shop, equipped with 2 oz. up to 8 oz. machines. All kinds of thermoplastic materials are moulded.

BELT CONVEYOR SYSTEM

A typical scene in the Streetly finishing shop. Remington shaver cases are finished and inspected on the conveyor line.

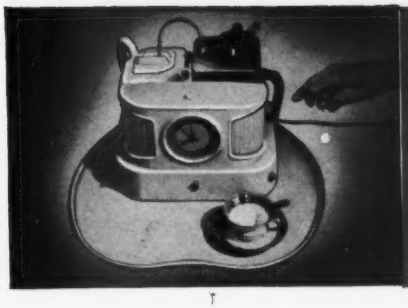
The Streetly Manufacturing Company Limited

Streetly Works • Sutton Coldfield • Telephone: Streetly 78411

B·I·P

Streetly...

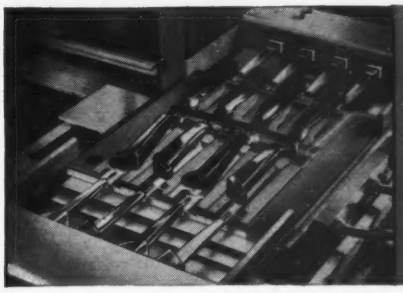
The Goblin Teasmade incorporates mouldings large and small in thermosetting and thermoplastic materials. The largest moulding weighs 2 lb. Bipel auto-control presses, Types 40, 100 and 200 are used for different thermosetting components.



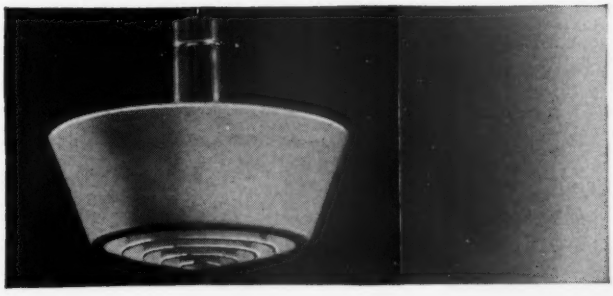
The Remington Super 60 Electric Shaver. Streetly makes the housings, and very close tolerances have to be maintained to ensure a perfect fit. Moulded in a Type 100 BIPEL auto-control press.

st in the long run —

Alongside are shown a few of the products of famous firms for whom we have been making major components for many years. The continuity of these contracts over long periods is no mere coincidence, for we are equipped and organised for the production of quality mouldings on a mass-production scale. Our prompt deliveries are 100% usable, for we apply the most scrupulous attention to detail in moulding, finishing, inspection and right down to final packing.

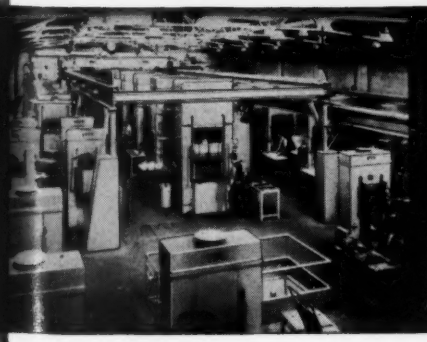


The Prestige Pressure Cooker Handle. Actually two handles, upper and lower are required, carefully designed to meet together. The tool produces four upper and four lower handles per cycle. A Type 200 BIPEL auto-control press is used.



The Ventura 80 Light Fittings The problem was to avoid flaws or flow marks in the translucent material. This was overcome by skilful tool design and the consistent cycle of the BIPEL Type 200 press.

The Esterbrook Desk Pen Set. Another example of Streetly versatility, for both thermosetting and thermoplastic mouldings are required. The pen tapers have to be moulded to optical standards and all components highly finished.



STREETLY MOULDING SHOP

The main shop. BIPEL presses throughout give a pressure range of 20-300 tons. There are two 1,000 ton compression presses.

STREETLY WORKS

Illustrating the extensive area of Streetly Works. All the moulding shops are situated to the left of the dark diagonal shadow.

The Comprehensive Moulding Service

Leading Moulders use

STERNITE

MOULDING POWDER

The Belvedere Toilet Assembly illustrated was moulded by EKCO PLASTICS LTD. in Sternite general purpose grade SPF. 34/3.

The Thermovent Heater Panel illustrated was moulded by EKCO PLASTICS LTD. in Sternite cabinet grade SPF. 41.

The comprehensive range of Sternite phenolic moulding materials includes a wide variety of general purpose and special purpose types including Telephone Grade 1, H.D., Low Loss, Medium Shock, Water, Heat, Acid and Alkali resistant grades, conforming to BSS.771, M.o.S., A.I.D., Post Office and Admiralty requirements.

Sterling Moulding Materials Ltd.

STERLING HOUSE, HEDDON STREET, LONDON, W.1.

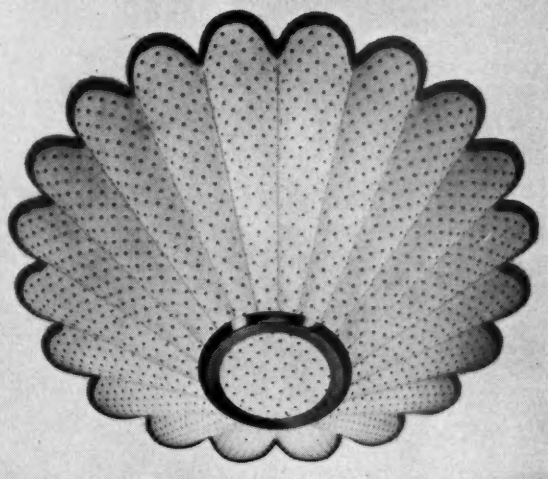
S.19

Works: Stalybridge, Cheshire. Phone: Grosvenor 5301/10. Grams: Stermold, Piccy, London. Cables: Stermold, London.

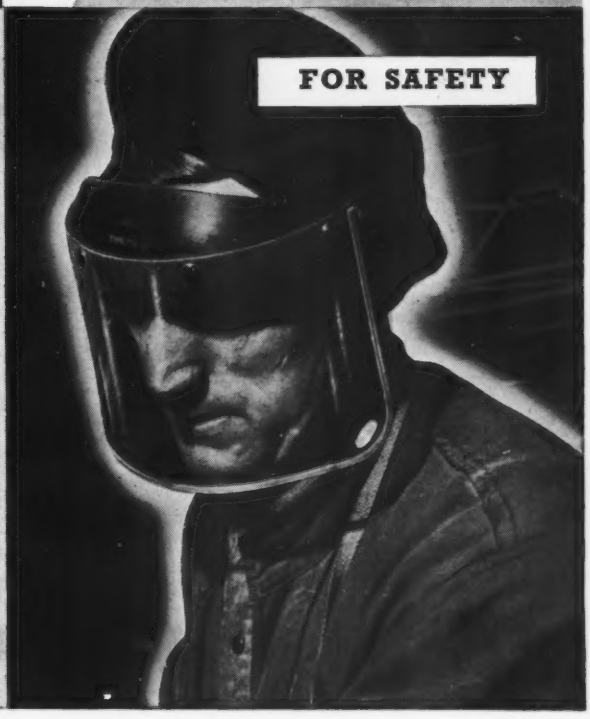
'Celastoid'
sheet

FOR GLAMOUR

FOR THE HOME



FOR SAFETY

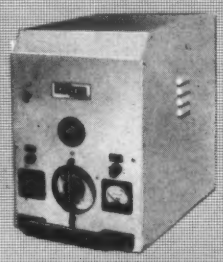


BRITISH CELANESE LIMITED

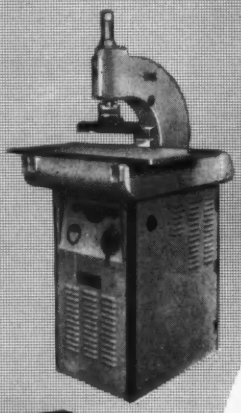
Plastics Division, Celanese House, Hanover Square, London, W.1

RADYNE

most extensive range of plastic sheet welders available



Model W.550. An efficient portable 600-watt generator coupled by flexible leads to various types of work-press.

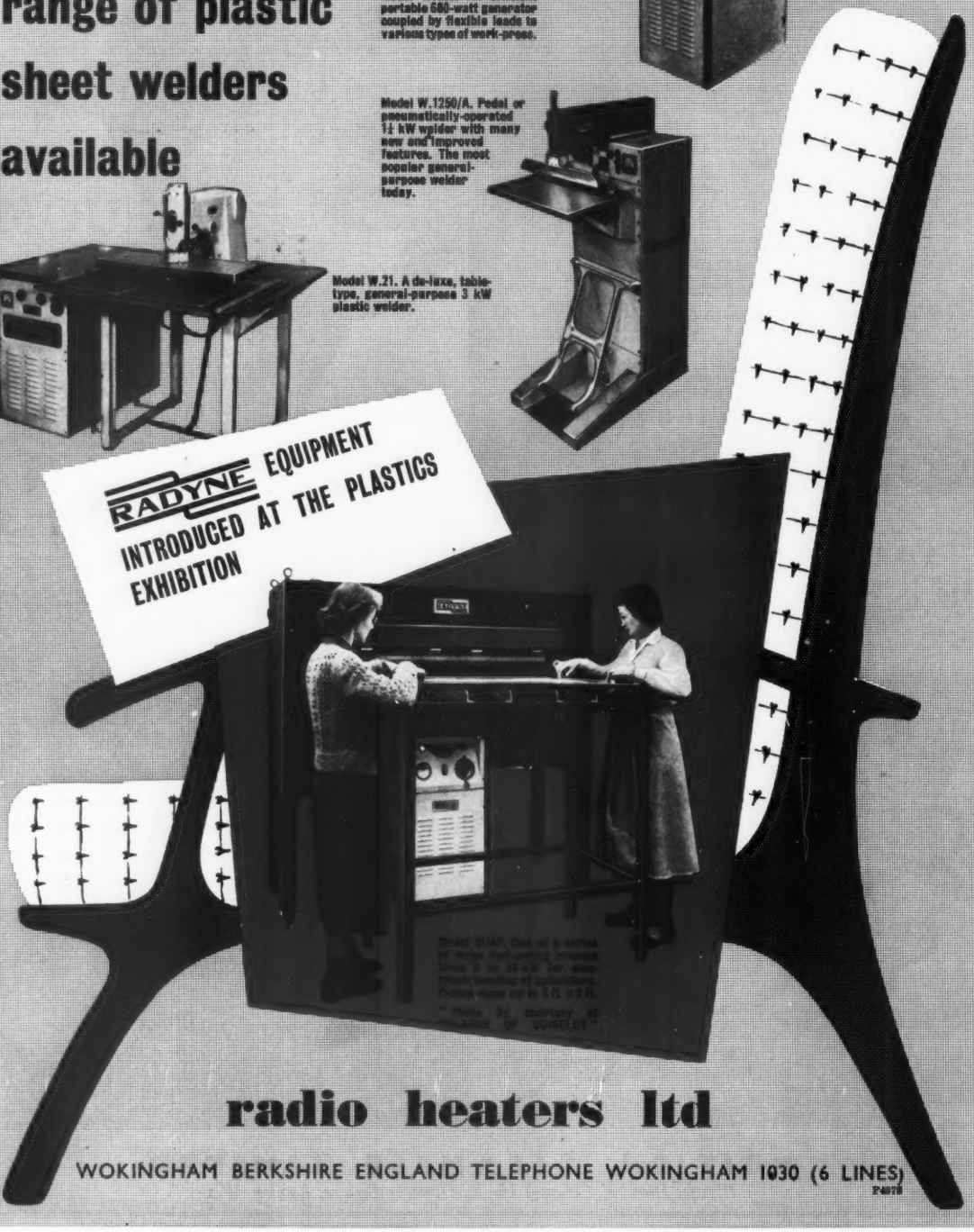


Model P.W.58/C. General-purpose 5 kW Press Welder. By far the most compact and efficient machine in its class.

Model W.1250/A. Pedal or pneumatically-operated 1½ kW welder with many new and improved features. The most popular general-purpose welder today.

Model W.21. A de-luxe, table-type, general-purpose 3 kW plastic welder.

RADYNE EQUIPMENT INTRODUCED AT THE PLASTICS EXHIBITION



radio heaters ltd

WOKINGHAM BERKSHIRE ENGLAND TELEPHONE WOKINGHAM 1030 (6 LINES)

P4078

COLOUR . . . BRILLIANT . . . PERMANENT

Throughout the plastics industry, Matthey cadmium pigments are known and employed for their reliability in the most arduous conditions of manufacture or of use. Combining brilliance with stability, providing high colouring power with resistance to heat, to light and to chemical attack, these remarkable pigments are available in a range from bright yellow to deep maroon.

Technical advice on the use of Matthey cadmium pigments in plastic production is freely given.

Johnson Matthey

Matthey

CADMIUM PIGMENTS

JOHNSON, MATTHEY & CO., LIMITED · HATTON GARDEN · LONDON · E.C.1

Telephone: HOLborn 6989

CPI

Dependable moulding a

- Rapid action H.P.M. straight-line hydraulic mould clamp, quick interchange of moulds with automatic adjustment for thickness.
- Full ejecting pressure secured at any point of the return stroke. Increased daylight and stroke for producing deep parts.
- High speed injection unit increases plasticizing rate, and fast injection plunger speed reduces cycle times.
- Accurate compensating weigh feeders, and an extra timer permit double feeding of material for large capacity shots.
- Dual injection pump for two-speed injection or dual pressure injection, as desired.
- Silent pumps supply hydraulic power for maximum clamping pressure and operation of clamp and injection rams.
- All hydraulic components are readily accessible. A minimum of pipe lines permits easy interchange of valves without interference.

BRITISH HPM BUILT

Model 800-H-48 48/64 oz

at lower cost per shot

Step up production with R.P.M. machines — the fastest injection moulders producing thermo-plastic parts at lower cost per shot than any other machines of comparable size.

They are fully automatic "all-hydraulic" machines possessing many outstanding features providing faster cycle times, powerful clamping and easy set-up, accurate material feed and high plasticizing capacity.

In addition they are economical with labour, floor space and materials, and are dependable too. The machines range in size to meet every moulding need, and each unit is backed by over seventy years' specialist service.

PLASTICS INJECTION MACHINES

SPECIFICATIONS

	Model 100-H-12	Model 440-H-20	Model 880-H-40
Volume moulded per shot (cu. ins.)	28	24	81
Weight moulded per shot (ozs.)	12	20	40
A prepacking or double stroke feed (ozs.)	14	28	64
Plasticizing capacity (lbs./hour)	132	288	360
Rate of injection (ozs./second)	16	17.5	40
Size of die plates	20" x 12"	24" x 42"	28" x 32"
	17" x 24"	24" x 32"	44" x 24"
Space between tie bars	24"	32"	32"
Mould opening stroke	24"	40"	32"
Maximum daylight	24"	32"	40"
Maximum daylight with spacer	24"	40"	48"
Minimum die space	10"	12"	20"
Minimum die space with spacer	4"	4"	12"
Mould locking pressure (U.S. tons)	200	400	880
Mould locking pressure (long tons)	178	358	786
Capacity of [illegible]	100	200	400
Power consumption of heating units when plasticizing to full capacity (kW.)	21.6	35.4	71.6
Motor required	40 h.p. nominal	60 h.p. nominal	100 h.p. and 10 h.p. nominal
Shipping weight (approx. tons)	6.6	11.5	23.5
Overall length and width	18' 6" x 5' 9"	20' 44" x 5' 9"	25' 3" x 7' 1"

All injection capacities specified above are for general purpose polystyrene.

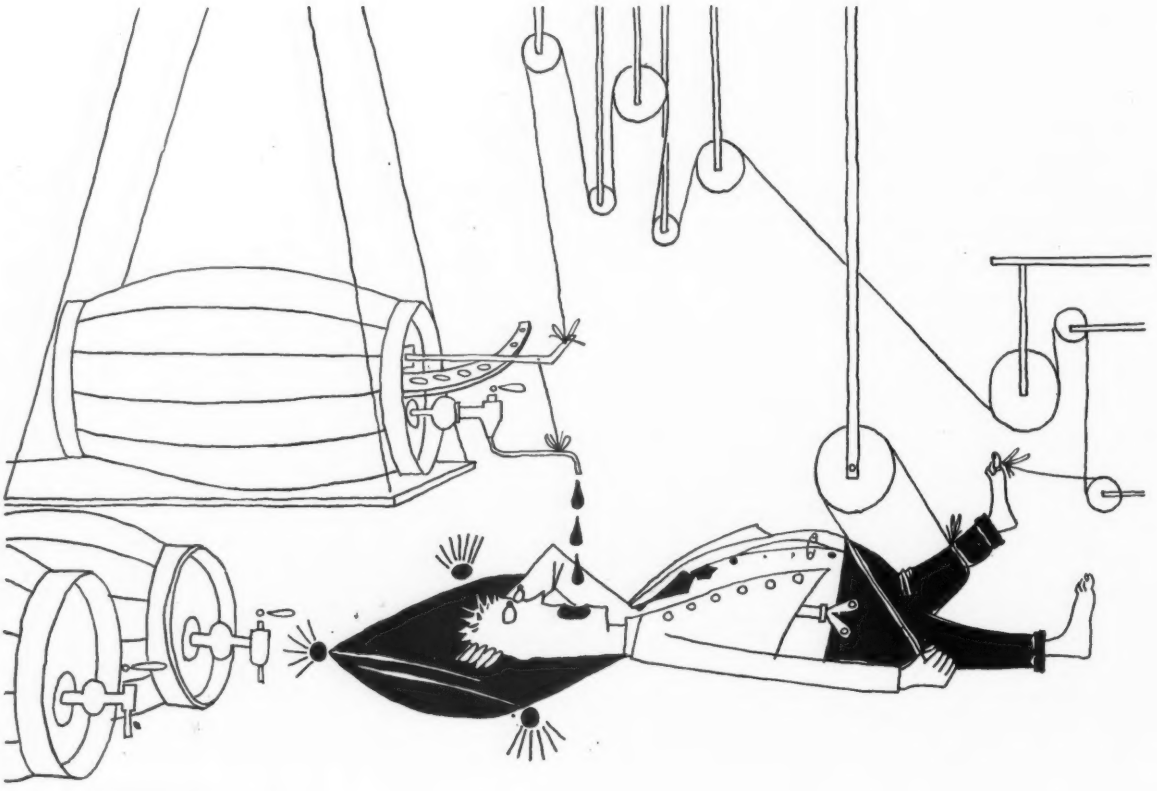
Details of other R.P.M. plastics injection machines on application.

Wickman

WICKMAN LIMITED

FACTORY MACHINE DIVISION, FLETCHAMSTEAD HIGHWAY, COVENTRY

Telephone: Coventry 88221



barrel-finishing is the nearest to automation in the plastics industry

Nice work!—and you can get it from Lacrinoid Products Ltd., who for years have been developing and perfecting the de-flashing, smoothing and polishing of plastics.

Like the best of anything the method is simple enough in principle, though what is right for one job need not be right for another.

We can find the particular answer to your finishing problem. The experience of our experts is yours for the asking—free of charge and without obligation.

Call us in for consultation, or write for our illustrated technical booklet.

LACRINOID

TRADE MARK

LACRINOID PRODUCTS LTD.—GIDEA PARK—ESSEX

Tel: Hornchurch 2981—Telex: London 28728

McN 678

We'll take it to pieces and put it together with Spire Speed Nuts

If you produce anything that involves fixing one part to another we should like to make you an offer. Here it is: send us a sample of the article you make. Our Product Survey Department will take it to pieces and reassemble it using Spire Speed Nuts, Screws and Clips. Your product will then be returned with an illustrated Fastening Analysis, showing what you would save in time and money by assembling with Spire Fasteners. THIS TECHNICAL SERVICE IS FREE OF CHARGE. If you're interested (and you should be!), drop us a line and we'll send you full details—or call in our Technical Representative, he's a fastening specialist.

Anything you fix **Spire** ***can fix faster***

Enquiries to: **SIMMONDS AEROCESSORIES LIMITED,**
Spire Speed Nut Division,
11a, Albemarle Street, London, W.1.
Tel: HYDe Park 5741/2

Head Office & Works: TREFOREST, PONTYPRIDD, GLAMORGAN.
Branches: Birmingham, Manchester, Glasgow, Stockholm, Copenhagen, Ballarat, Sydney, Johannesburg, Amsterdam, Milan and New York.

A MEMBER OF THE FIRTH CLEVELAND GROUP

FC

CRC 473

PAY OFFS

Self-contained Pay-Off Reel Stand for reels from 16" to 96" flange diameter.

For plastic Moulding complete with pump and Greer-Mercier Hydropneumatic Accumulator. The Press is semi-automatic in operation and is capable of extremely fast cycling having approach speeds up to 3" per second. A feature of the unit is the economical hydraulic power system in which a hydro-pneumatic accumulator provides the necessary high volume for the fast cycling — a small single stage pump being used to keep the accumulator charged during the cure period. Platen areas are 14"x14" between columns with a daylight of 18".

50 TON DOWN-STROKING PRE-FILLING SEMI AUTOMATIC PRESS

FAWCETT FINNEY LIMITED

offer

5 IMPORTANT SERVICES

foremost for Plastics and Rubber Equipment

1. Hydraulic Presses for the Plastic, Rubber and Engineering Trades. Baling Presses for fibres and metal.
2. High Pressure Pumps, Valves and Accumulators for all industrial applications for oil or water.
3. Extruding Machines for rubber and plastics, with complete ancillary equipment for wire, sheeting and tubing. Injection moulding machines, automatic Hopper Loader and Mould Temperature Controllers.
4. Greer-Mercier Hydro-Pneumatic Accumulators Hydraulic Line Shock Allevistors, Gauge Protection Valves, Pressure Switches.
5. Electric, Gas and Steam Hotplates, Heat Circulating Units and Exchangers.

TAKE-UPS

Both single and dual take-ups are available for reels up to 96" diameter. Dual take-up operation is continuous and automatic, including transfer of wire from reel to reel with pneumatic raising and lowering and automatic braking. The operator only needs to replace full reels with empty ones.

DAVIS-STANDARD EXTRUDERS

Assure high velocity extrusion with maximum operating efficiency. Fawcett-Finney engineers, with an intimate knowledge of the extrusion industry's needs and problems, will be glad to confer with you to determine the most efficient installation for your operation.

FAWCETT-FINNEY LIMITED

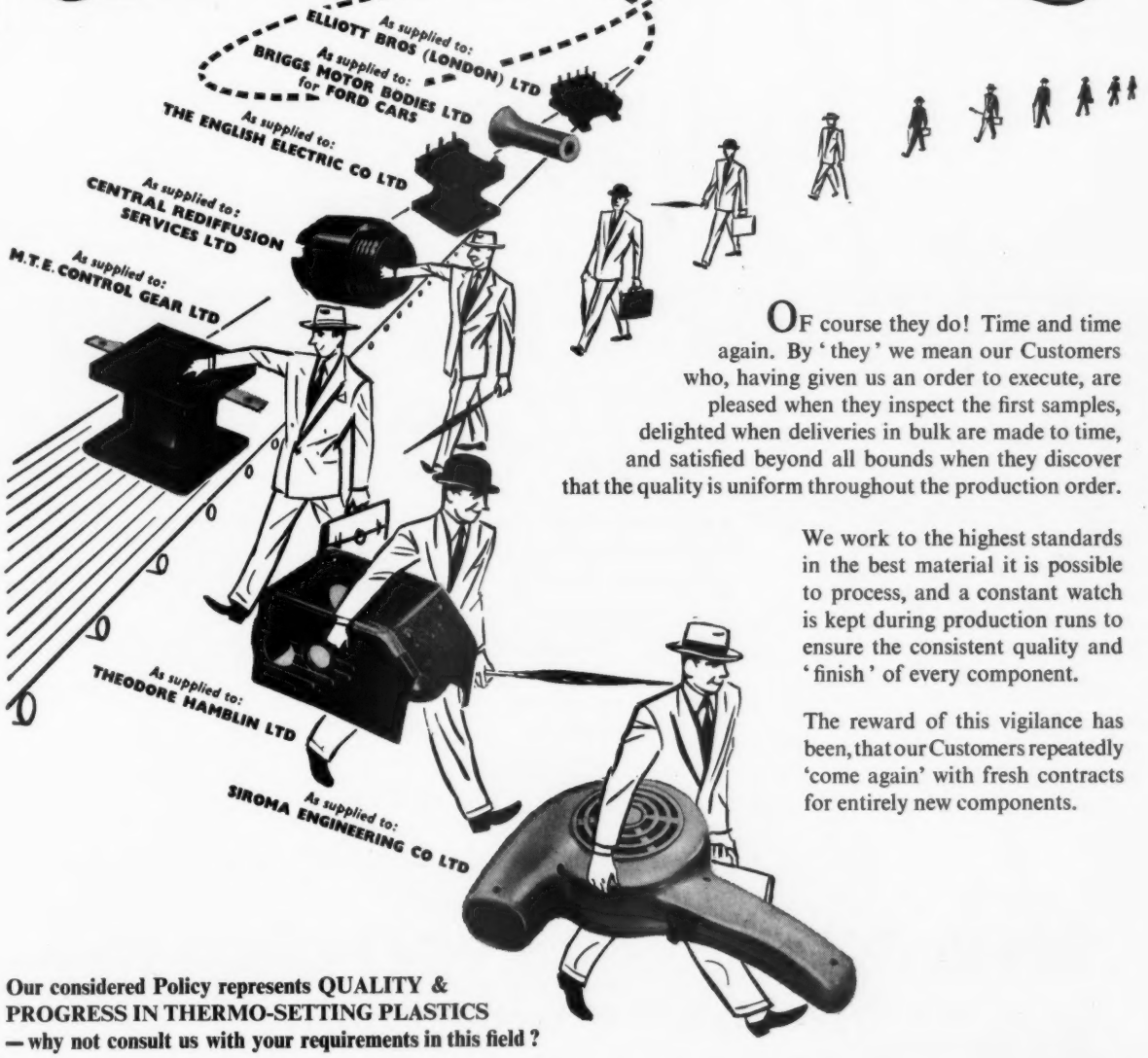
BERKLEY STREET, BIRMINGHAM, 1

Tel: MIDland 3795/6/7. Cables: Finhyd, Birmingham 1

In association with FAWCETT PRESTON & COMPANY LIMITED, BROMBOROUGH, CHESHIRE and FINNEY PRESSES LIMITED, BERKLEY STREET, BIRMINGHAM 1

FF/142

Come again?


As supplied to: ELLIOTT BROS (LONDON) LTD
As supplied to: BRIGGS MOTOR BODIES LTD for FORD CARS
As supplied to: THE ENGLISH ELECTRIC CO LTD
As supplied to: CENTRAL REDIFFUSION SERVICES LTD
As supplied to: M.T.E. CONTROL GEAR LTD
As supplied to: THEODORE HAMBLIN LTD
As supplied to: SIROMA ENGINEERING CO LTD

OF course they do! Time and time again. By 'they' we mean our Customers who, having given us an order to execute, are pleased when they inspect the first samples, delighted when deliveries in bulk are made to time, and satisfied beyond all bounds when they discover that the quality is uniform throughout the production order.

We work to the highest standards in the best material it is possible to process, and a constant watch is kept during production runs to ensure the consistent quality and 'finish' of every component.

The reward of this vigilance has been, that our Customers repeatedly 'come again' with fresh contracts for entirely new components.

Our considered Policy represents QUALITY & PROGRESS IN THERMO-SETTING PLASTICS — why not consult us with your requirements in this field?

Metropolitan Plastics Ltd

CERTIFIED ZINC ALLOY ZAMCA DIE CASTERS

Telephone: TIDeway 1172-3

GLENVILLE GROVE · DEPTFORD · LONDON S.E.8

Ask

CRYSTALATE

to quote for

MOULDED PLASTICS

Compression, Transfer and
Injection Mouldings in Plastics
to Customers' Specifications
in all Trades.
Synthetic Resin Bonded
Paper (S.R.B.P.) Tubes,
Bobbins and Formers.
Vacuum Forming.

CRYSTALATE LTD., associating MICA PRODUCTS LTD.

Crystalate House, Tonbridge, Kent.

Phones: Tonbridge 2261/5 (25 lines)

58 years experience at your service

EXTRUDER SCREWS NEED

Toolchrome

We render an essential service
to the Plastics Industry not only
applying Hard Chromium and Polishing
to extruder Screws, but assisting the
industry to produce first class Mouldings.
Compression or Injection Moulds
treated by the **Toolchrome** process
help to increase output.

Approved by A.I.D & A.R.B.

MR. H. A. R. D. CHROME

ANNIS WORKS ANNIS ROAD LONDON E9 *Tel:* **AMHerst 2735**

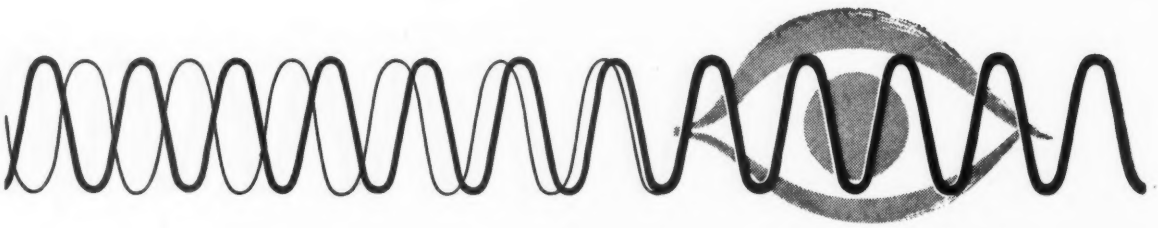
SOUTH GREEN WORKS BILLERICAY ESSEX *Tel:* **BILLERICAY 2**

The Hard Chrome Depositors with the Engineering background

Electronic control does it quicker

Automatic control cuts out innumerable hold-ups in production and adds valuable time to every working day. It can be applied in a great many different ways, from a simple timer that stops and starts machines, to the complex feed-back devices that regulate machines against a standard reference while they are in action, as in register control on colour-printing presses.

Whatever your process you would find it well worth while to consider automatic control in one form or another. It is more exact than is humanly possible; rejects are reduced; quality is improved; the flow of production is quicker and smoother; it uses little current and calls for little maintenance. In fact, you get higher production at lower cost. This is only one of the ways in which electricity is playing a vital part in the drive for higher productivity.



Electricity for Productivity

Ask your ELECTRICITY BOARD for advice and information, or get in touch with E.D.A. They can lend you, without charge, films about the uses of electricity in industry. E.D.A. are also publishing a series of books on Electricity and Productivity. Titles now available are: Electric Motors and Controls, Electric Resistance Heating, Higher Production, Lighting in Industry, Materials Handling, and the latest addition to the series, Induction and Dielectric Heating. Price 8/6, or 9/- post free.

Issued by the British Electrical Development Association, 2 Savoy Hill, London, W.C.2

Bristol 100-gallon plastic drop-tanks on Hawker Hunte

HOW BRISTOL PLASTICS SOLVED VITAL PROBLEMS OF STRENGTH AND CONSISTENCY

The external fittings of a supersonic aircraft must be built to very close tolerances: even the slightest variation in aerodynamic form could adversely affect high-speed handling. With drop-tanks—where an aircraft may have a new set each day—this means that every tank must be aerodynamically identical, and every tank component completely interchangeable. This consistency of manufacture is vitally important.

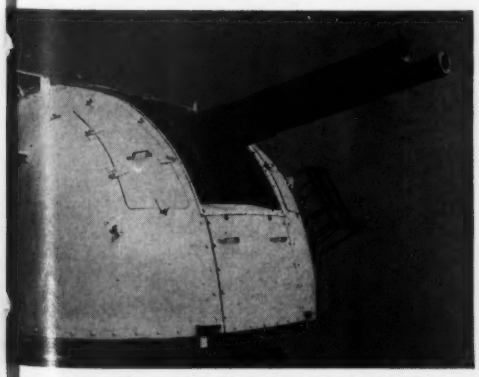
Under combat conditions the same tanks have to withstand enormous stresses—especially at their points of attachment. This means they have to be structurally extremely strong.

How to build such tanks presented considerable design and manufacturing problems.

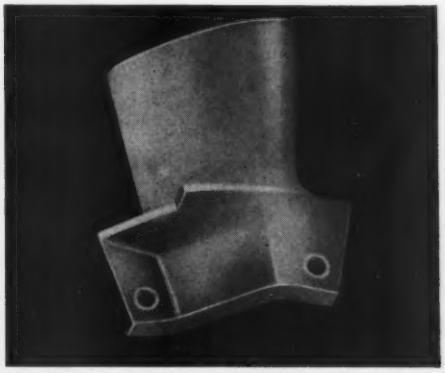
But by the application of sound engineering techniques to resin-bonded asbestos fibre, Bristol's plastics technologists were able to produce a tank that was not only stronger and lighter than its aluminium counterpart but considerably cheaper. And as the tank moulds are identical, aerodynamic consistency ceased to be a problem. Bristol drop-tanks are now being built under licence in many countries.

The drop-tanks problem is only one solved by the Bristol Plastics group. In the past few years Bristol has assembled a team second to none in the design and development of high-efficiency plastics structures.

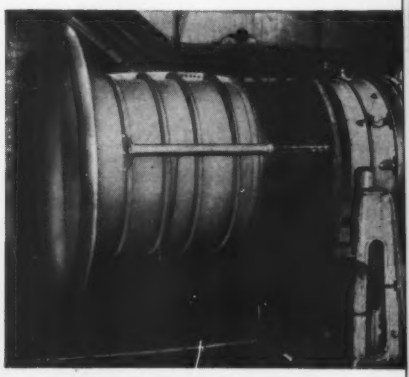
BRISTOL
Plastics
BRISTOL AIRCRAFT LIMITED



Large-scale moulded plastic blast shields for naval 4.5 guns have proved as strong as their metal counterparts at a fraction of the weight—and plastic shields never corrode.



Helicopter cooling fan blades of injection-moulded glass fibre have proved superior to both steel and aluminium in fatigue characteristics. They are also much cheaper to produce.

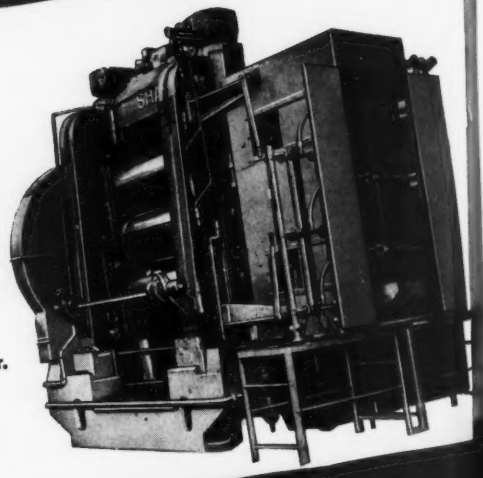


Experimental air intake for Bristol Olympus turboje The internal contour of the duct is extremely accurat manufacture in metal would have proved long an costly.

SHAW

CALENDER

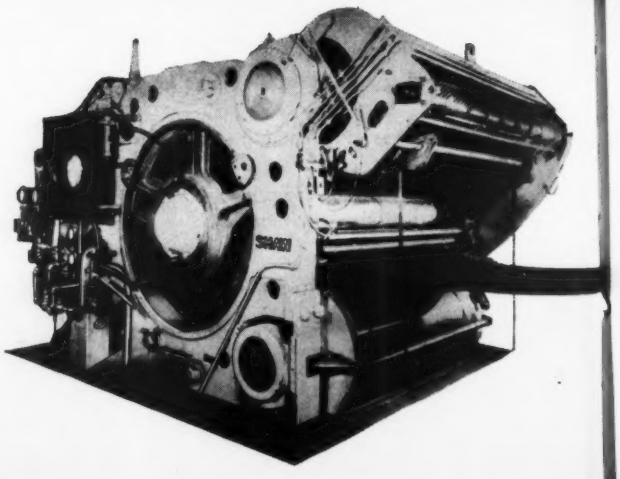
One of a range of modern calenders designed for maximum efficiency with absolute economy. Press-button control. Individual drive can be supplied to each roller.



quality engineering for quantity production

ROTOCURE

For the continuous bonding of plastics for the production of belting, flooring, matting and similar flat products.



FRANCIS SHAW & CO LTD MANCHESTER 11 ENGLAND

PHONE EAST 1415/8 GRAMS CALENDER MANCHESTER TELEX 66-357

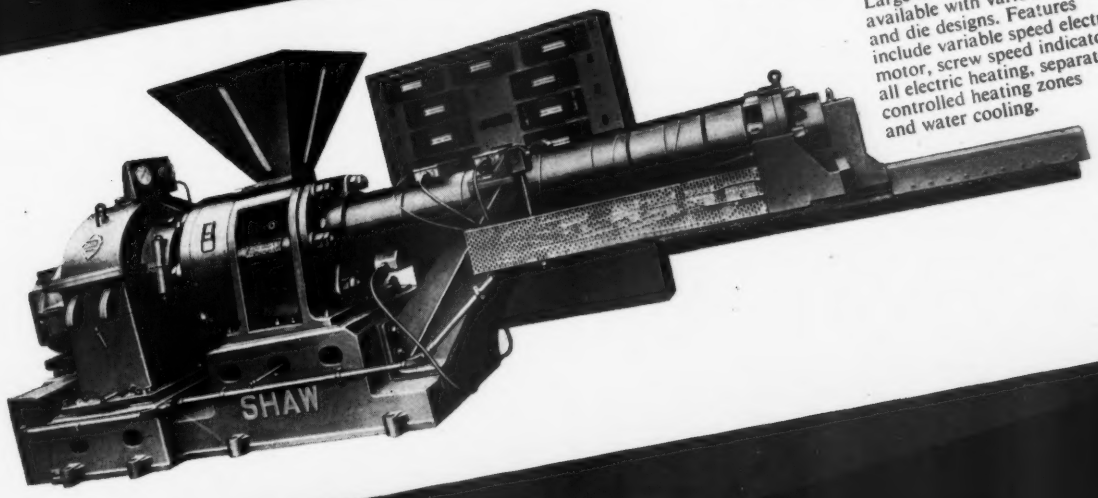
LONDON OFFICE: TERMINAL HOUSE GROSVENOR GARDENS LONDON SW1

PHONE SLOANE 0675/6 TELEX 2-2250 GRAMS VIBRATE LONDON TELEX

PLASTICS PLANT

PLASTIC EXTRUDER

Large machines of this type are available with various screw and die designs. Features include variable speed electric motor, screw speed indicator, all electric heating, separately controlled heating zones and water cooling.



from machines to complete layouts

INTERMIX

A versatile machine for compounding plastic products and a wide range of materials. Features include exclusive rotor design, anti-friction bearings, unit drive and two-speed motor.

Francis Shaw offer the experience of over 70 years and plant of the most advanced design. Our services include planning and layout of new plant or modernisation projects.

FRANCIS SHAW (CANADA) LTD GRAHAMS LANE BURLINGTON ONTARIO CANADA

TELEPHONE: NELSON 4-2350 TELEGRAMS: CALENDER BURLINGTON ONTARIO

CHEMIDUS 2000

. . . still the outstanding corrosion-resistant non-contaminating piping material

This high purity truly unplasticized PVC is a moderately priced rigid plastic pipe ideally suitable for most acid and other corrosive conditions, and for water, gas and sewage work.

PIPES 1/4" TO 14" DIA. ALSO BARS TO 4" DIA.

Standard sizes—Ex stock deliveries.

CHEMIDUS

INDUSTRIAL VENTILATION TUBING

3" TO 14" DIA.

Seamless extruded tubing available from stock in natural colour, red and green.

CHEMIDUS HI-20

The latest addition to the Chemidus range—the plastic pipe for applications where shock-resistance is of prime importance.

CHEMIDUS

COLOURED TUBING & BAR

Rigid non-tarnishing tubulars and rods for all trades.

If you missed seeing these outstanding materials at the British Plastics Exhibition you are cordially invited to write to:—

CHEMIDUS
CHEMICAL & INDUSTRIAL PLASTICS

CHEMIDUS PLASTICS LTD.
DOMINION BUILDINGS, SOUTH PLACE, LONDON, E.C.2. Telephone: MONarch 0131

laminates embosses and prints **in one operation!**

LEMBO LAMINATOR-EMBOSSER performs these 3 functions on all plastic film . . .

1

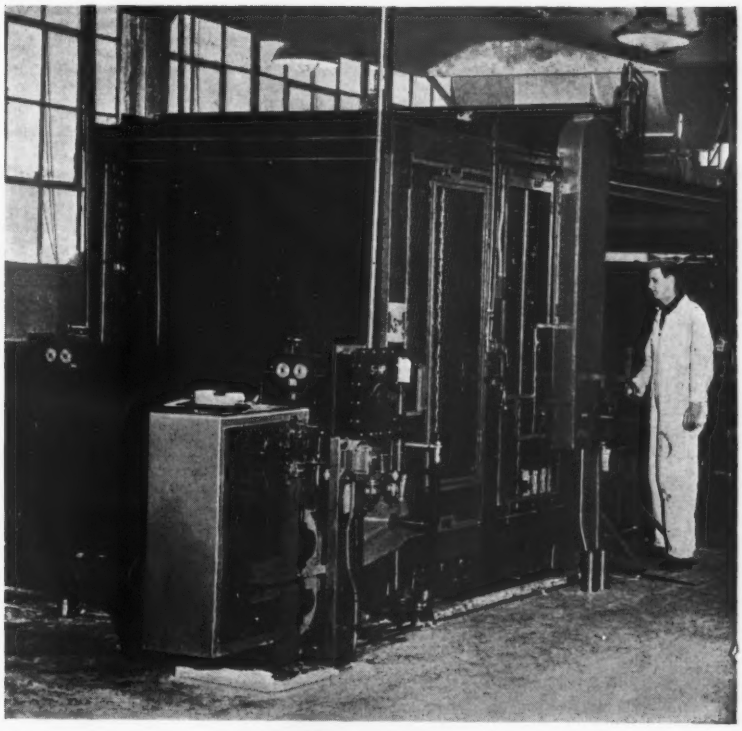
LAMINATES
stretch back or drills
*without adhesives!**

2

EMBOSSES

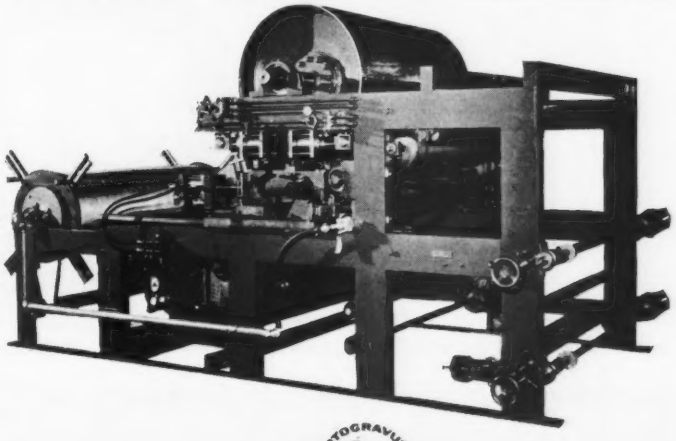
3

VALLEY PRINTS
to closest tolerances



Compact, and costing only a fraction of mammoth equipment usually performing these jobs, it is especially practical for both short or long runs. If your operation can benefit by fast, flexible equipment at considerably lower outlay and upkeep, you're invited to see the new LEMBO LAMINATOR-EMBOSSER in action. We will be happy to make experimental runs for you.

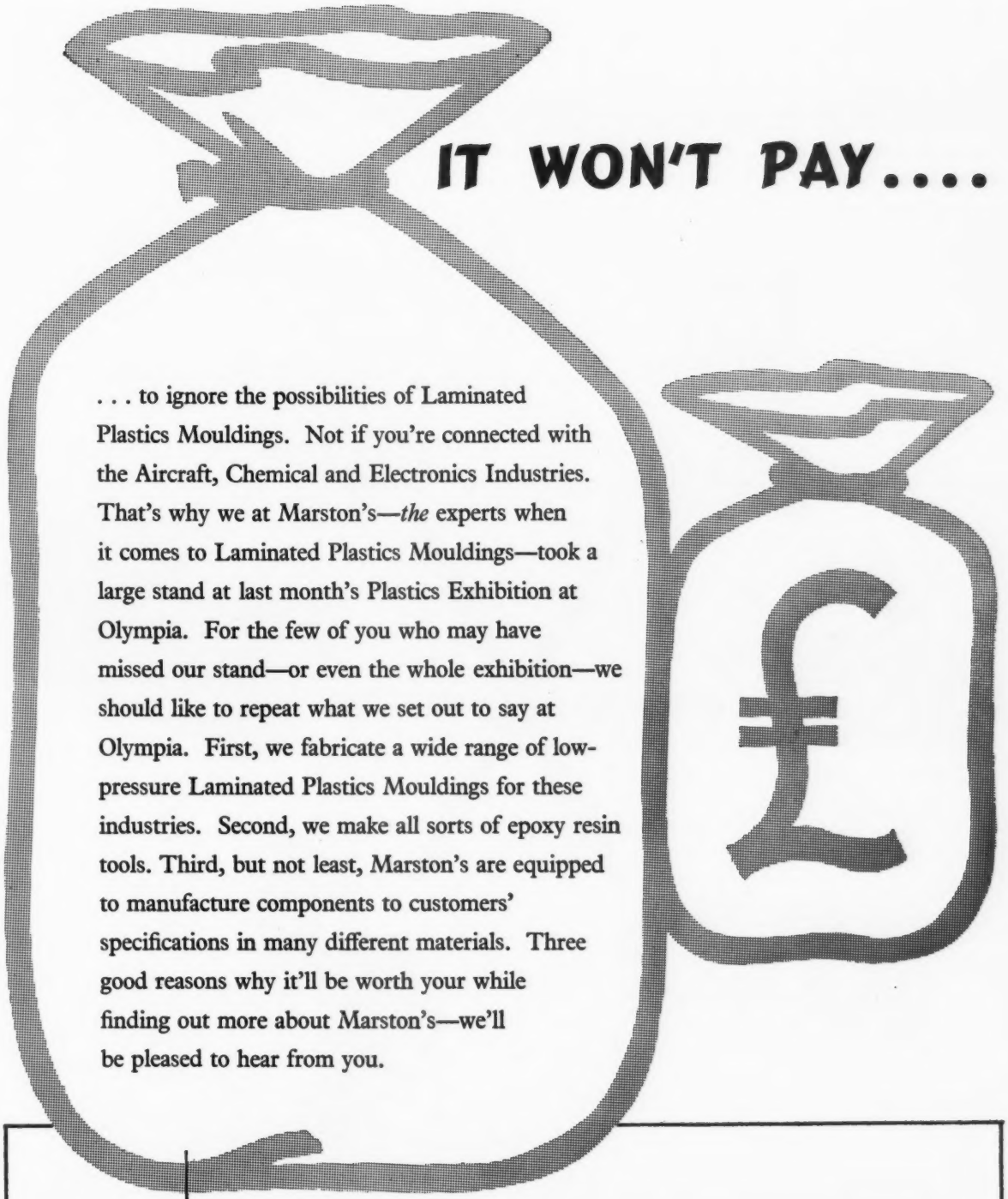
* Subject to proper film formulation and gauge.



LEMBO
MACHINE WORKS, INC.
248 EAST 17th St. . Paterson 4, N.J., U.S.A. . Lambert 5-5555
Mfrs. PRESSES . EMBOSSERS . LAMINATORS . ROLLERS

ROTOGRAVURE LEMBO PRESS FLEXOGRAPHIC

British Titan Products
brighten products
...particularly
PLASTICS
The high tinting strength
of TITANIUM OXIDE,
the finest white pigment
in the world,
gives brightest colours
and opacity with
minimum loading.
BTP
TITANIUM
PIGMENTS
BRITISH TITAN PRODUCTS COMPANY LIMITED YORK
13C
THE LARGEST TITANIUM PIGMENT MANUFACTURER OUTSIDE THE UNITED STATES



IT WON'T PAY....

. . . to ignore the possibilities of Laminated Plastics Mouldings. Not if you're connected with the Aircraft, Chemical and Electronics Industries. That's why we at Marston's—*the* experts when it comes to Laminated Plastics Mouldings—took a large stand at last month's Plastics Exhibition at Olympia. For the few of you who may have missed our stand—or even the whole exhibition—we should like to repeat what we set out to say at Olympia. First, we fabricate a wide range of low-pressure Laminated Plastics Mouldings for these industries. Second, we make all sorts of epoxy resin tools. Third, but not least, Marston's are equipped to manufacture components to customers' specifications in many different materials. Three good reasons why it'll be worth your while finding out more about Marston's—we'll be pleased to hear from you.

MARSTON EXCELSIOR LIMITED

A subsidiary company of Imperial Chemical Industries Limited

Wobaston Road—Fordhouses—Wolverhampton

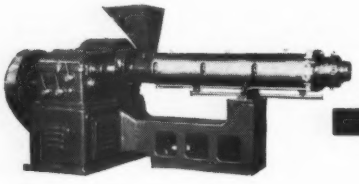
Tel: Fordhouses 3361 Telegrams: ICIMAREX Wolverhampton

MAR 211B

PLANT FOR PLASTICS AND ANCILLARY EQUIPMENT

Cube Dicer—
Rubber, Plastics, Linoleum

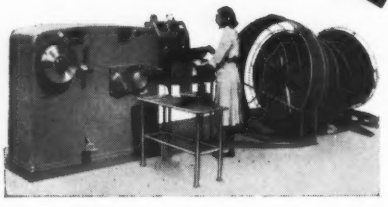
Vibrator, Screener Conveyor



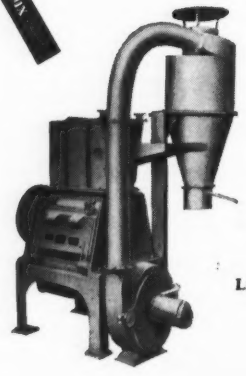
Extruder, 1½"–8"

The Girovinyle
The Fluidflow
The Bandera
IPL
The Eck
The Decombe
The Condux

'Mixtruder'
Continuous Compounder



Fully automatic Coiler



Lump Cutter and Grinder

IPL

INDUSTRIAL PLASTICS LIMITED

93 Regent St., London W1 *Tel.: REGent 3146/9 Cables: Ipla London*

DEMONSTRATION AND SHOWROOM: 93 Harrow Road, London W2

Available now!

GEON RA 170

the only HIGH IMPACT

grade of rigid PVC

The introduction of Geon RA 170 is one of
the most important developments in the history of PVC.
Here for the first time is a High Impact rigid PVC compound
with a toughness 15 times that of ordinary rigid PVC.
To its exceptional impact strength Geon RA 170
adds the well-known Geon advantages of corrosion resistance,
light weight and high tensile strength.
Such properties make Geon RA 170 particularly suitable for
rigid pipe and ducting which have to survive mechanical
stress or which are exposed to corrosive attack.
For complete technical information about Geon RA 170
write for Information Sheet G.101/51.

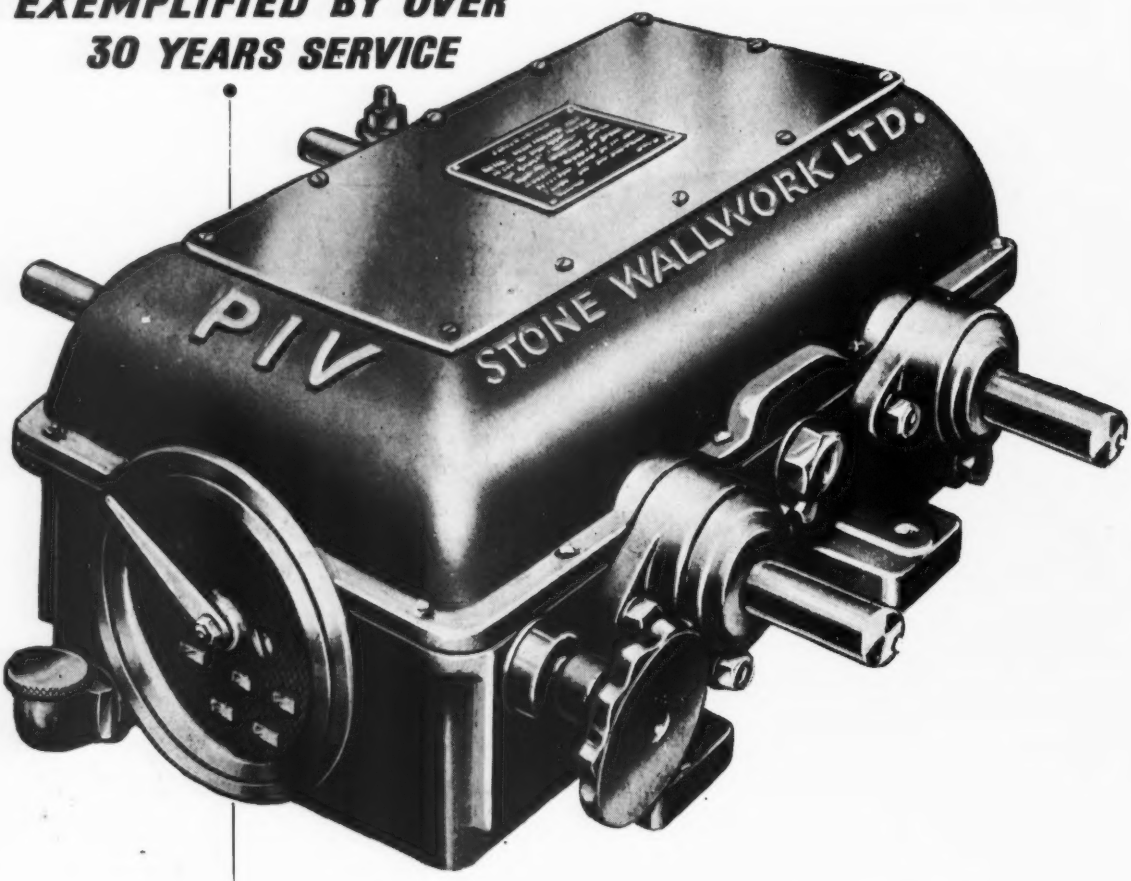
'Geon' is a reg'd trade mark

British Geon Limited

SALES AND TECHNICAL SERVICE · DEVONSHIRE HOUSE PICCADILLY LONDON W1 · MAYfair 8867

Reliability

EXEMPLIFIED BY OVER 30 YEARS SERVICE



THE

P I V

POSITIVE INFINITELY VARIABLE

GEAR BOX

The P.I.V. gear itself provides an infinite variation of speeds within a range of 6/1 giving, according to size, speeds of 1716/286 r.p.m. to 1225/204 r.p.m.

These speeds can be reduced to as low as 1·2/0·2 r.p.m. by using a Compound P.I.V. gear, whereby an auxiliary reduction unit of spur or worm gears is fitted integral to the P.I.V. gear.

By using the "E" type of Compound gear the range of speeds may be extended to 700 to 0 r.p.m. or plus 350 to minus 350 r.p.m. The power capacity extends from ½ to 20 h.p.

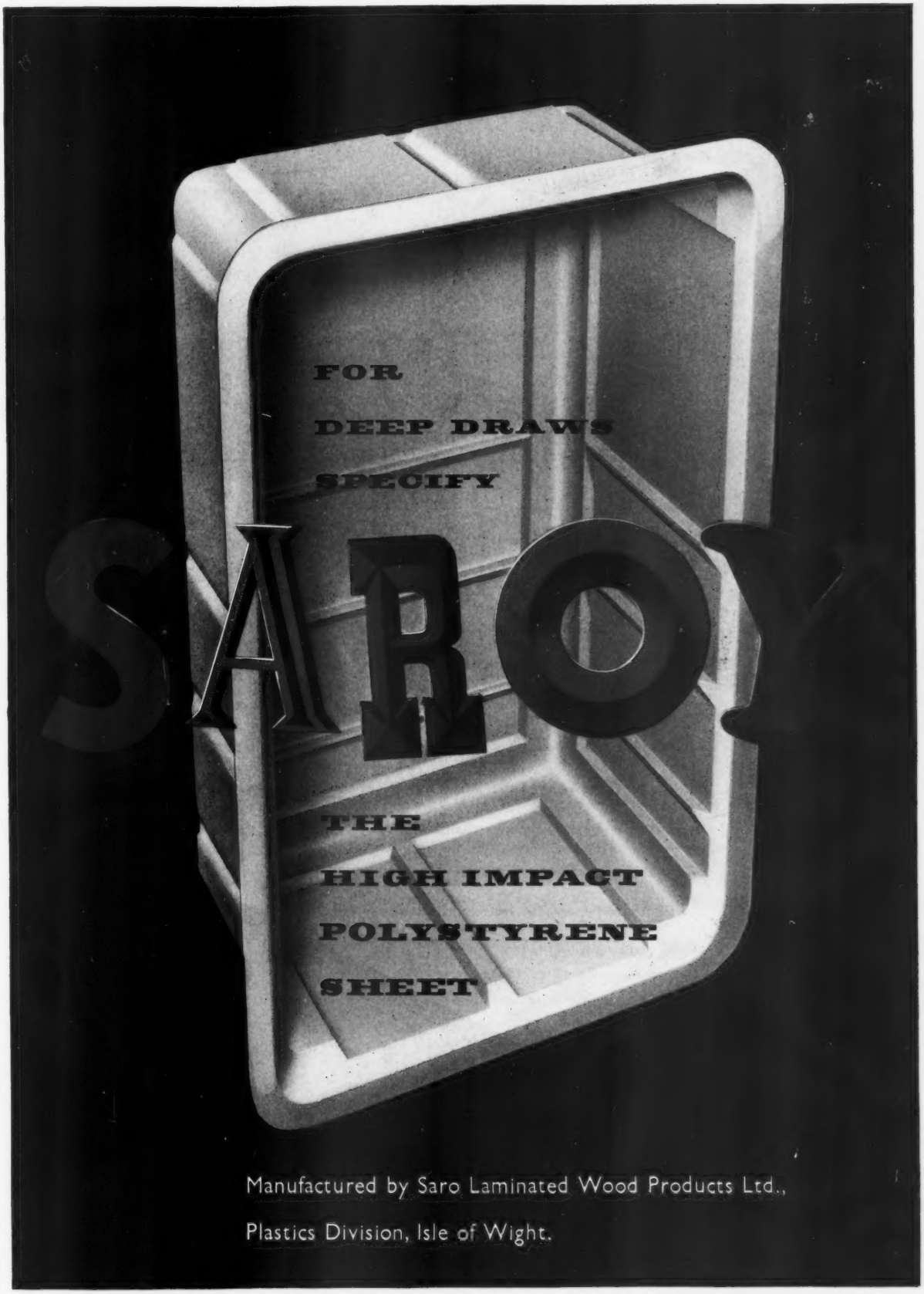
STONE–WALLWORK LIMITED

THE J. Stone Group

32, VICTORIA ST., LONDON, S.W.1 Phone: Abbey 7681. Grams: "Stonwalabb" Sowest, London.

WORKS: OLDHAM, LANCASHIRE. Also STOTFOLD, BEDFORDSHIRE.

Also manufacturers of Worm Reduction Gears, STONWAL Flexible Couplings, Piece Goods Stamping Machines and Light Alloy Bobbins for the Textile Trade.



● *This Refrigerator Liner, made from ·125" thickness SAROY, measures 19½" x 33½" x 12¾" deep.*

Nash

★ ★ Base papers for plastics ★ ★

WILLIAM NASH LIMITED

have made Fine Papers for over 100 years and during the present century have developed qualities for technical and industrial uses. Base Paper for the Plastic Industry is now a regular product at Cray Valley Paper Mills and its manufacture is under the supervision of specially trained technicians to ensure regularity of quality. All enquiries for this type of paper will receive most careful attention and individual specifications can be closely followed.

CRAY VALLEY PAPER MILLS

ST. PAULS CRAY · ORPINGTON · KENT

Moulding World History

So successful was Alexander the Great in all of his military ventures that he came to be looked upon as god-like and divine, which enabled his empire to become firmly established.

FERGUSON'S do not claim to be divine or god-like despite what their customers say and who often comment on the success of 'NESTORITE' Service, which is ever alert and available for the supply of SPECIAL POWDERS FOR SPECIFIC PURPOSES.

You're RIGHT with 'NESTORITE'

James Ferguson & Sons Ltd.

LEA PARK WORKS, PRINCE GEORGE'S ROAD, MERTON ABBEY, LONDON, S.W.19. Tel: MITCHAM 2283 (5 lines). 'Grams: NESTORIUS SOUPHONE, LONDON

A. S. HARRISON & CO. (PTY) LTD.	85 Clarence St., Sydney, Australia. 120 Wakefield St., Wellington, New Zealand.
ANDRE BERJONNEAU	134 Avenue de Villiers, Paris 17, France.
JOSE DELCLOS MOLLERA	Angel Baixeras 39, Barcelona (2), Spain.
EINAR HOLMARK	19 Gl. Kongevej, Copenhagen V, Denmark.
ALLMANNA HANDELSAKTIEBOLAGET	Stockholm, Sweden.

if you are interested in PLASTICS

if you make plastics raw materials—vinyls, butadiene derivatives, cellulose acetate—you'll be interested in D.C.L. basic chemicals—calcium carbide, butadiene, vinyl acetate, acetic anhydride and the rest;

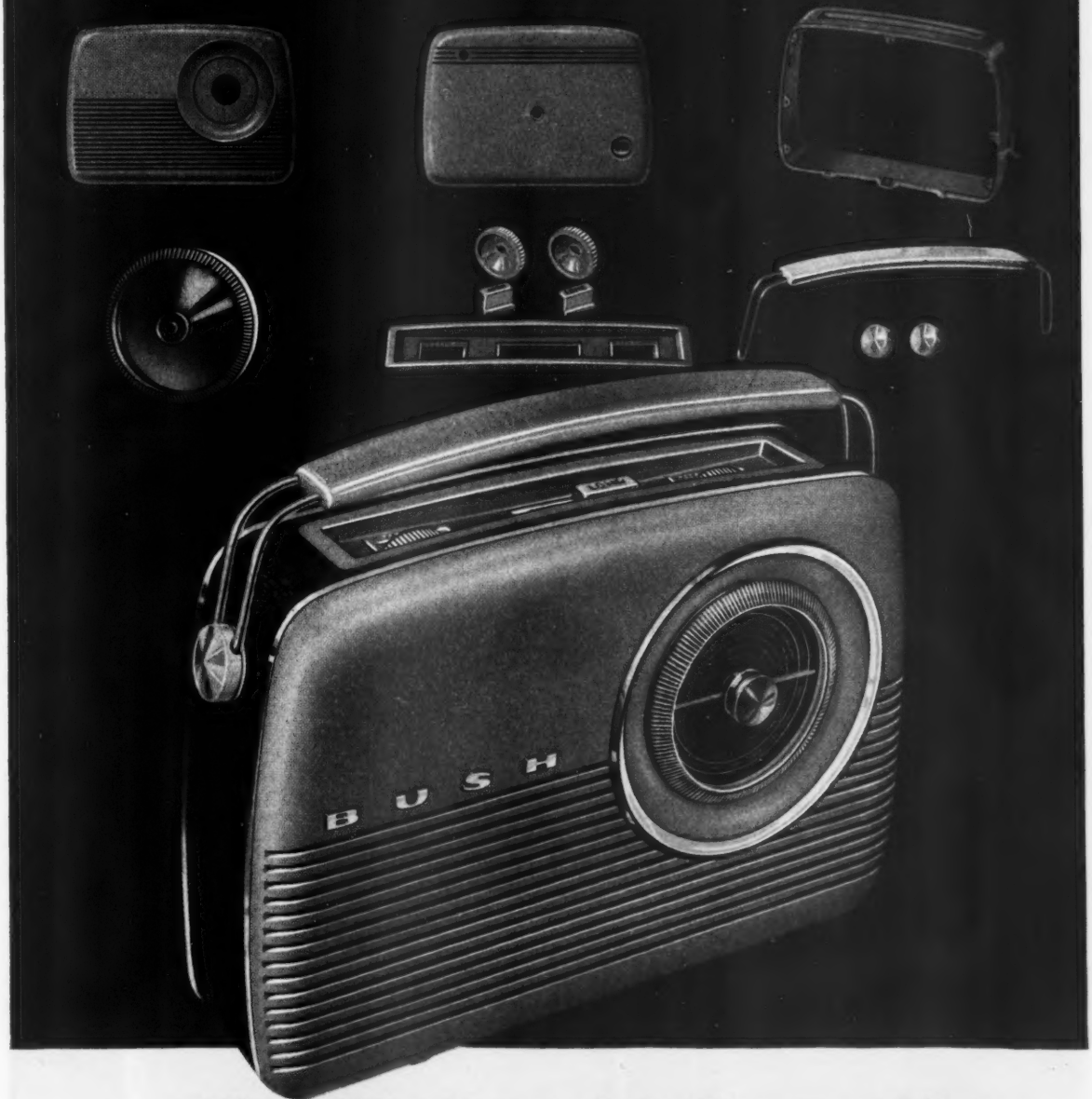
if you make compounds for flexible plastics, you'll be interested in D.C.L. plasticisers—for general purposes and for special applications—low-temperature, anti-static and low-viscosity paste uses;

throughout the industry you'll be interested in D.C.L. solvents, from primary processing to printing of P.V.C., and in the miscellaneous products for mould lubrication, 'tack' reduction, and antimycotic use in packaging films.

Full technical and commercial information is available from British Industrial Solvents (The Distillers Company Limited—Chemical Division), Devonshire House, Mayfair Place, Piccadilly, London, W.1. (MAYfair 8867).

take an interest in D C L CHEMICALS

In tune with today . . .



. . . with brilliant new injection mouldings

Many wise birds will settle on this new Bush. Not only is it smarter and neater — but lighter and stronger, too. The case, dial, knobs, buttons, switches and handle are all injection moulded by Insulators. Everything clicks into place to make a tip-top portable radio — ready to go anywhere and give years of Bush reliability into the bargain. Have you a problem in plastics? Insulators can place at your disposal more than 30 years of experience — plus the services of 3 separate factories specialising in compression, injection and fibre-glass mouldings respectively. Have a word with us today. *Moulding materials used were high-impact and general purpose Polystyrene. Modern injection machines ranging from 2oz. to 16/32oz. were used for this production.*

Insulators Ltd

MOULDINGS OF MERIT

Leopold Road, Angel Road, Edmonton, London, N.18

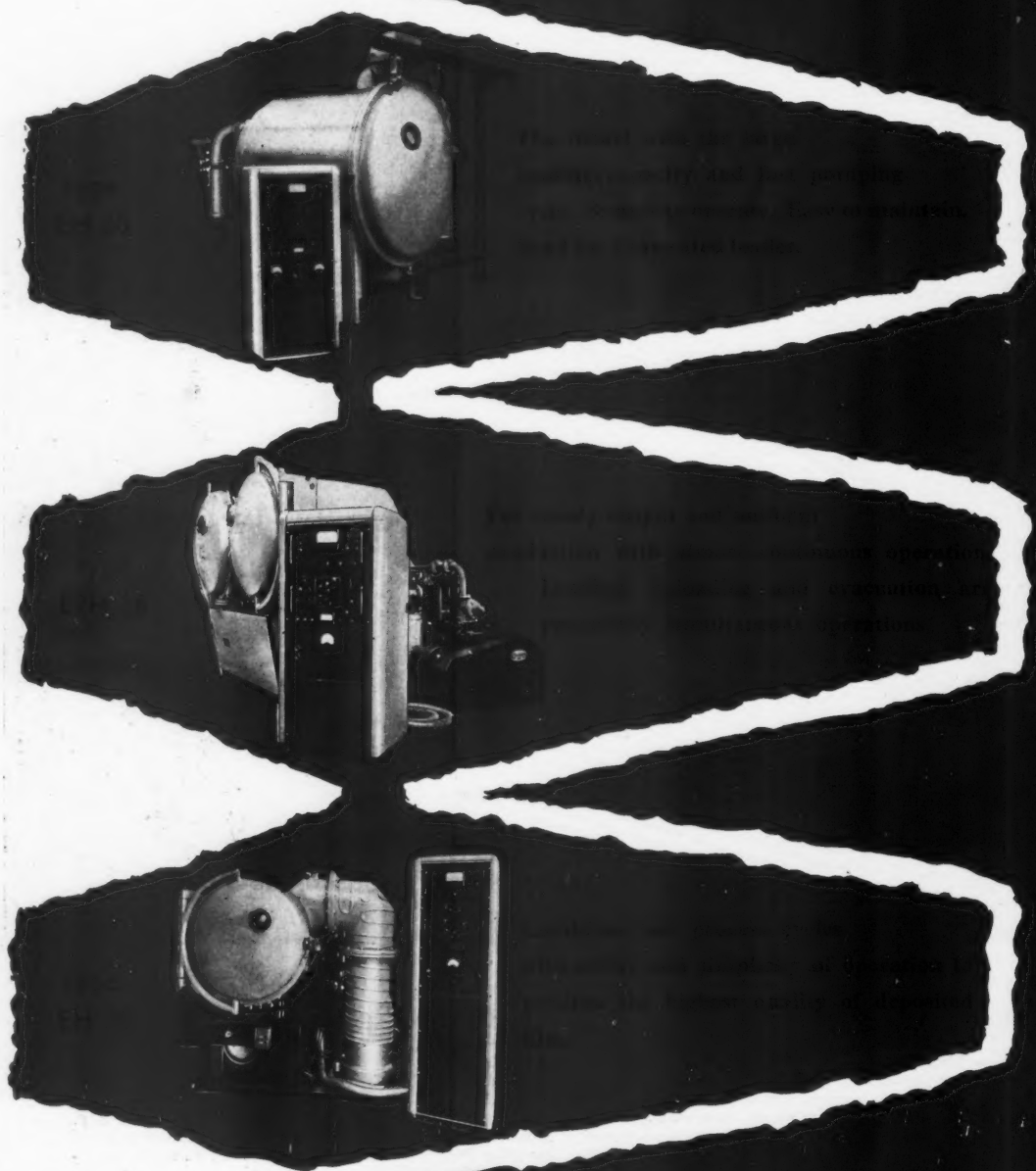
Branch Factories: JARROW DURHAM and PADDOCK WOOD, KENT *'Phone: EDMonton 1491 'Grams: Mermould, Southtot, London*

FAST,
DURABLE,
ECONOMICAL
COATING

with

VIA-VAC

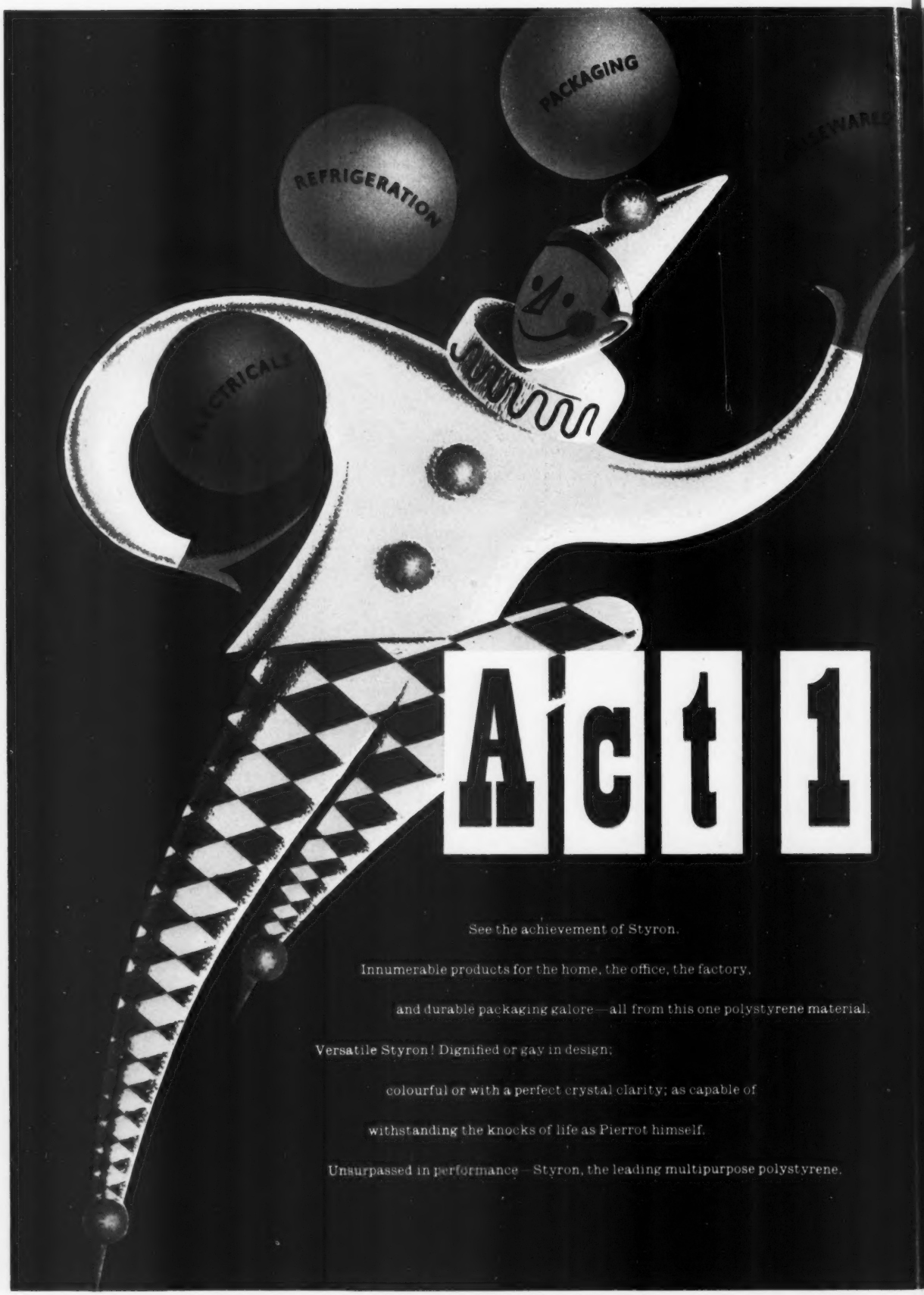
EQUIPMENT



VACUUM INDUSTRIAL APPLICATIONS LTD., KILBRIDE ROAD, WISHAW, LANARKSHIRE, SCOTLAND

Telephone: *Wishaw 142
Telegrams: "VIA-VAC, WISHAW"

sicostirol 951 general purpose
sicostirol 510 impact grade
in pellets
120 colours
transparents
translucents
opaques
metallics
pearlescents
shells

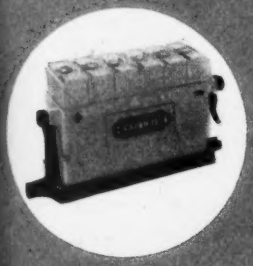

PACKAGING
REFRIGERATION
Act 1
See the achievement of Styron.
Innumerable products for the home, the office, the factory,
and durable packaging galore—all from this one polystyrene material.
Versatile Styron! Dignified or gay in design;
colourful or with a perfect crystal clarity; as capable of
withstanding the knocks of life as Pierrot himself.
Unsurpassed in performance—Styron, the leading multipurpose polystyrene.

Seen Everywhere!

TOYS

thousands of products in . . .

STYRON
Polystyrene



★ crystal clear or in 60 colours and 3,000 shades

★ easily moulded or vacuum formed

★ performs well at low temperatures

★ excellent electrical properties

★ light; tough; non-greasy to the touch

★ odourless; non-toxic; non-rusting

For full information about Styron – its properties and wealth of applications – write for Booklet No. 200

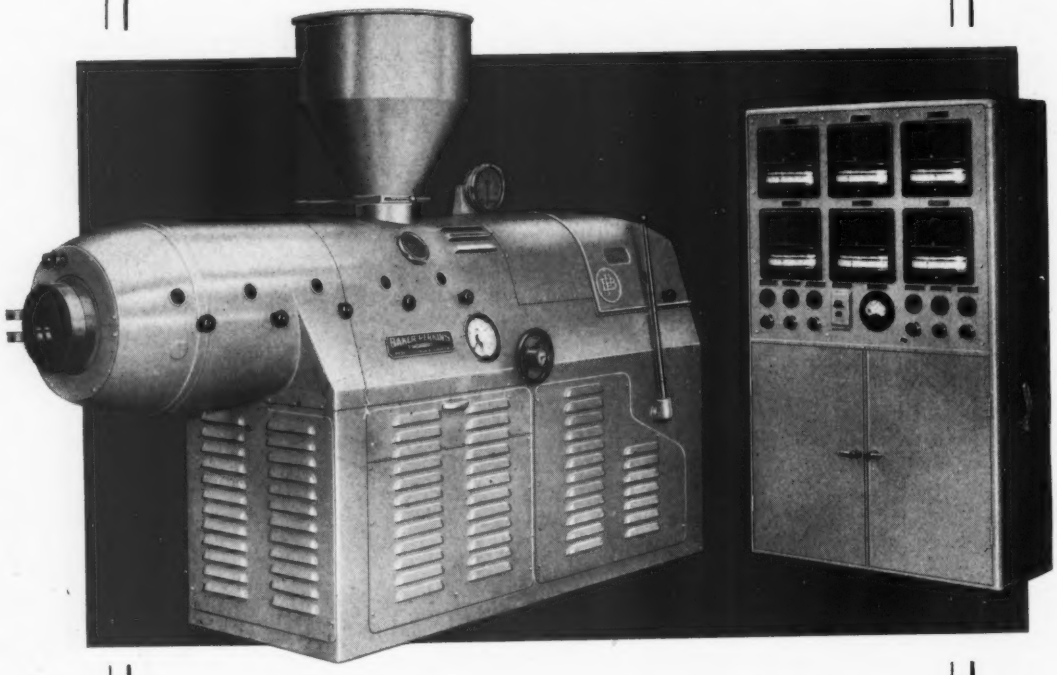
BRP

Sole Selling Agents **BRITISH RESIN PRODUCTS LIMITED**
Sales and Technical Service DEVONSHIRE HOUSE, PICCADILLY, LONDON W1 MAYfair 8867

Manufactured by Distrene Ltd. The polystyrene manufactured by Distrene Ltd., is marketed abroad under the registered trade mark 'Distrene'

A NEW EXTRUDER

(3½" dia.—single screw)

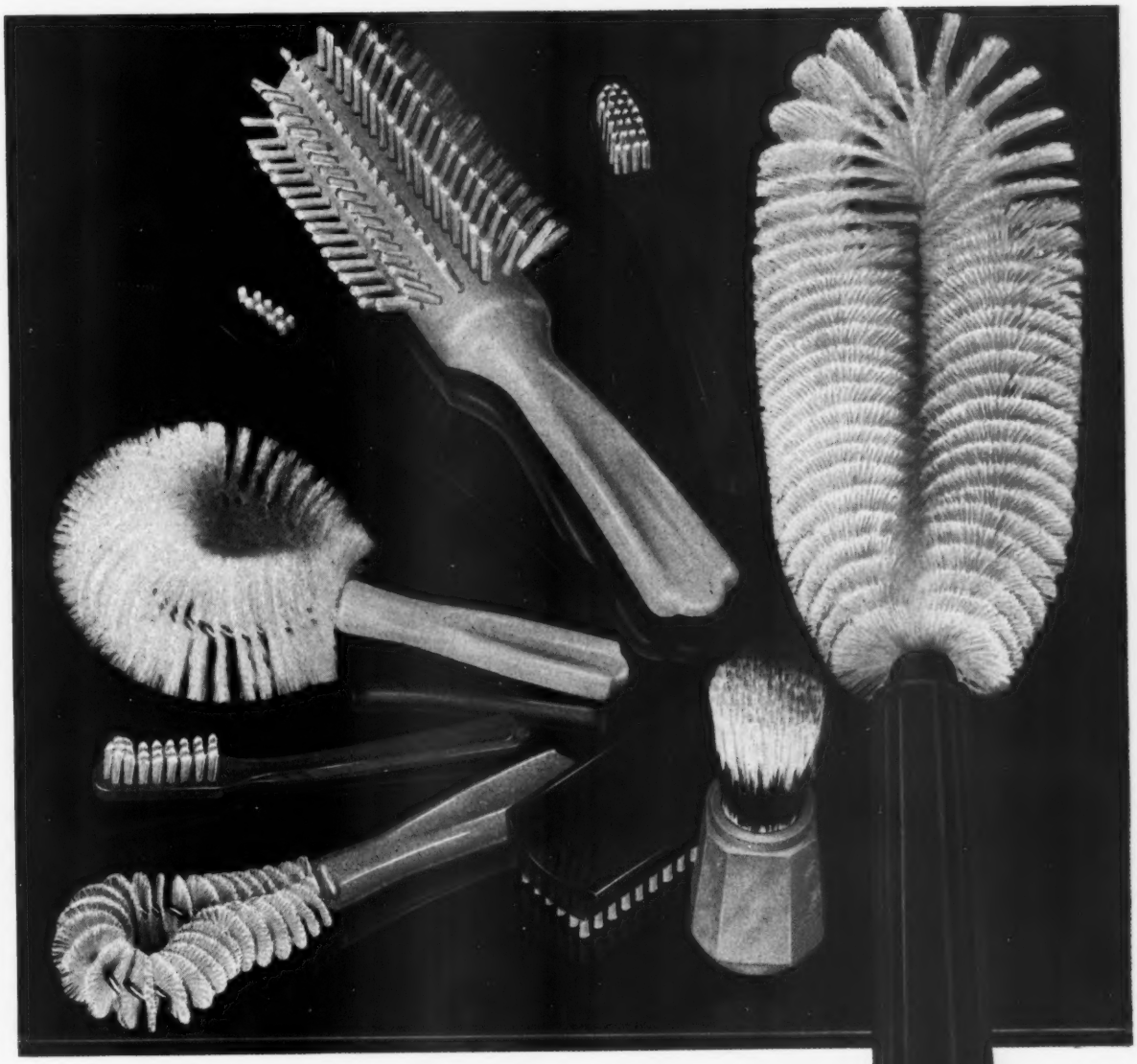


" Thanks to all who visited our stand at the British Plastics Exhibition. We were gratified by the amount of interest shown in our exhibits and feel sure that our extruders will make for themselves in the Plastics Trade a reputation equal to that which our mixing machines have held for many years. Our newly designed range of miniature mixers for laboratory use were hailed as a boon to the research chemist and engineer."

BAKER PERKINS LIMITED

ENGINEERS

WESTWOOD WORKS · PETERBOROUGH



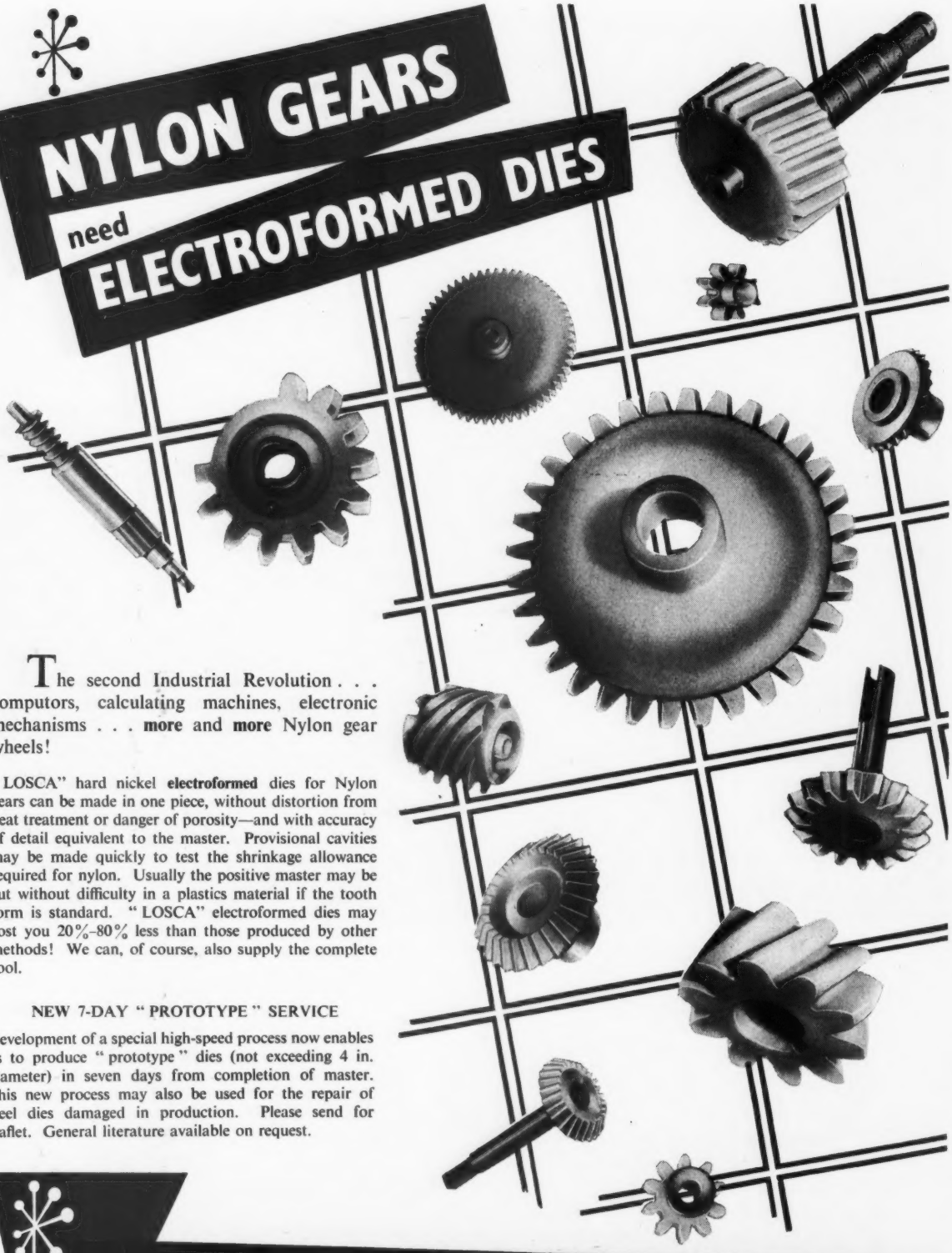
Erinoid

Special grades of Erinoid Cellulose Acetate for brushes are chosen by leading manufacturers for their toughness, moisture resistance and beautiful fast colours.

Brush handles moulded in Erinoid Cellulose Acetate Powders by J. E. Snow Ltd., Sheffield, for Kleen-e-ze Brush Co. Ltd.

ERINOID LIMITED STROUD GLOUCESTERSHIRE

NYLON GEARS need ELECTROFORMED DIES



The second Industrial Revolution . . . computors, calculating machines, electronic mechanisms . . . **more** and **more** Nylon gear wheels!

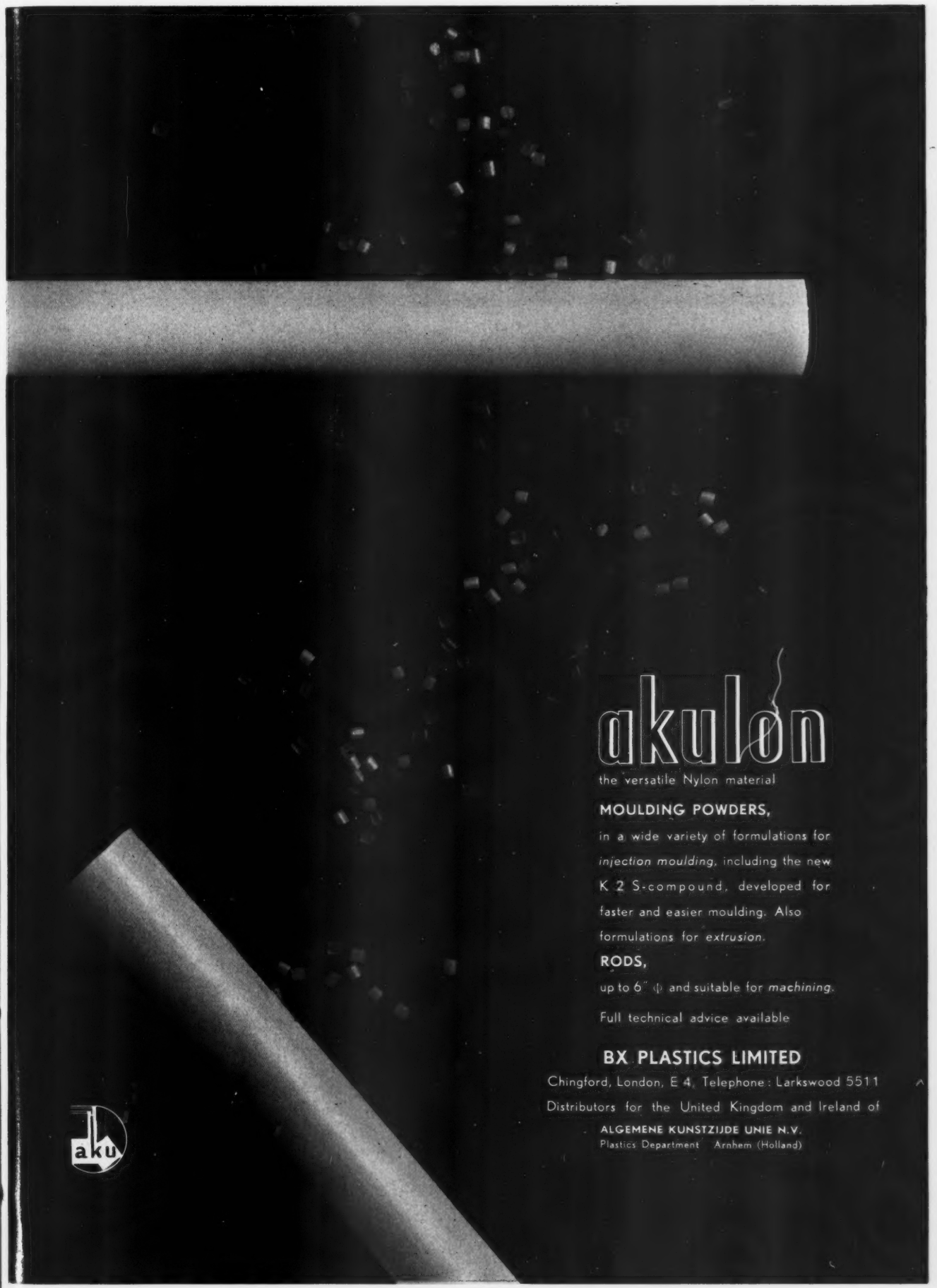
"LOSCA" hard nickel **electroformed** dies for Nylon gears can be made in one piece, without distortion from heat treatment or danger of porosity—and with accuracy of detail equivalent to the master. Provisional cavities may be made quickly to test the shrinkage allowance required for nylon. Usually the positive master may be cut without difficulty in a plastics material if the tooth form is standard. "LOSCA" electroformed dies may cost you 20%–80% less than those produced by other methods! We can, of course, also supply the complete tool.

NEW 7-DAY "PROTOTYPE" SERVICE

Development of a special high-speed process now enables us to produce "prototype" dies (not exceeding 4 in. diameter) in seven days from completion of master. This new process may also be used for the repair of steel dies damaged in production. Please send for leaflet. General literature available on request.

LONDON & SCANDINAVIAN METALLURGICAL CO LIMITED

WELLINGTON WORKS, WELLINGTON ROAD, WIMBLEDON, LONDON, S.W.19. Telephone: WIMbledon 6301–2–3



the versatile Nylon material

MOULDING POWDERS,

in a wide variety of formulations for *injection moulding*, including the new K 2 S-compound, developed for faster and easier moulding. Also formulations for *extrusion*.

RODS,

up to 6" Φ and suitable for *machining*.

Full technical advice available

BX PLASTICS LIMITED

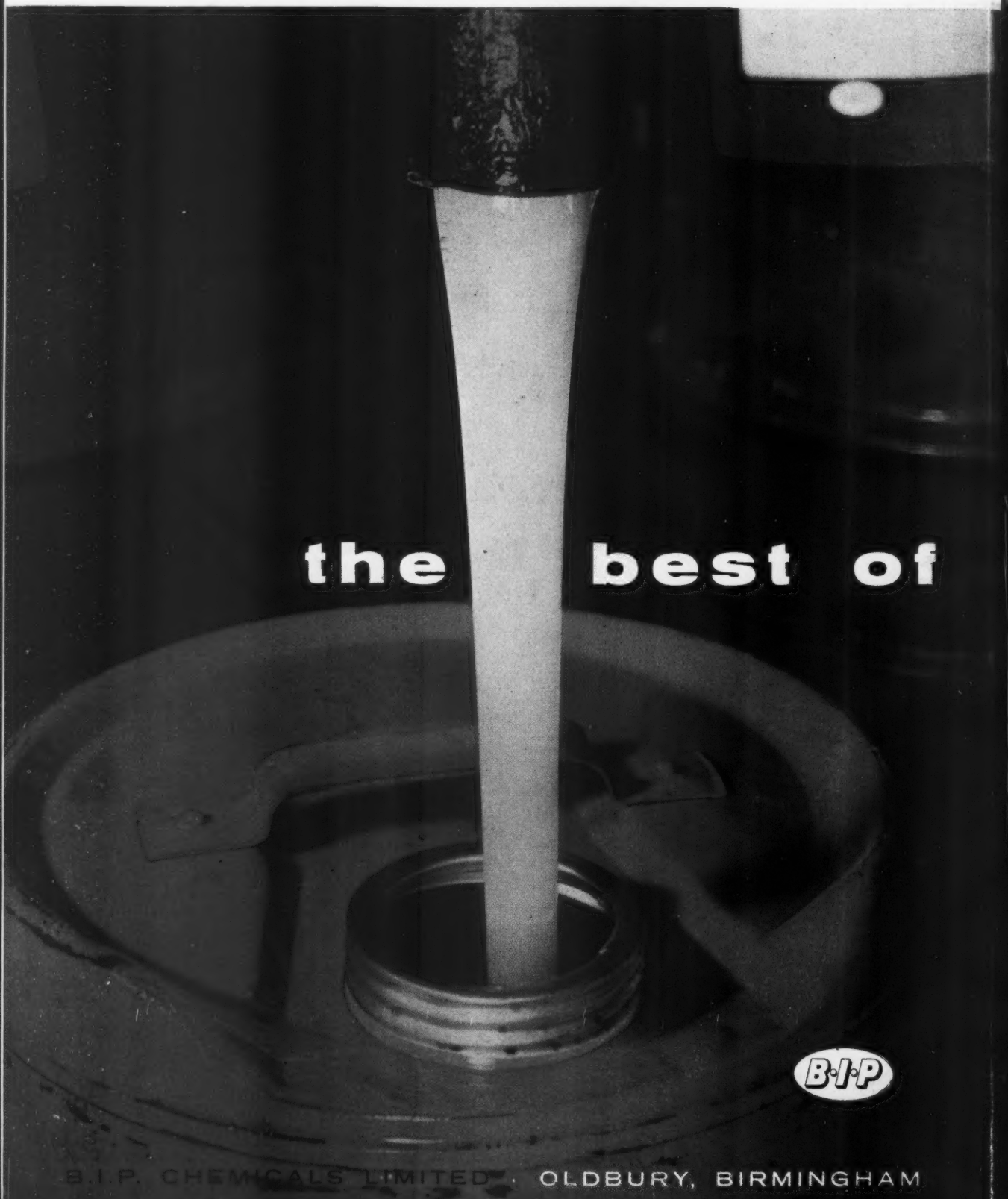
Chingford, London, E 4. Telephone: Larkswood 5511

Distributors for the United Kingdom and Ireland of

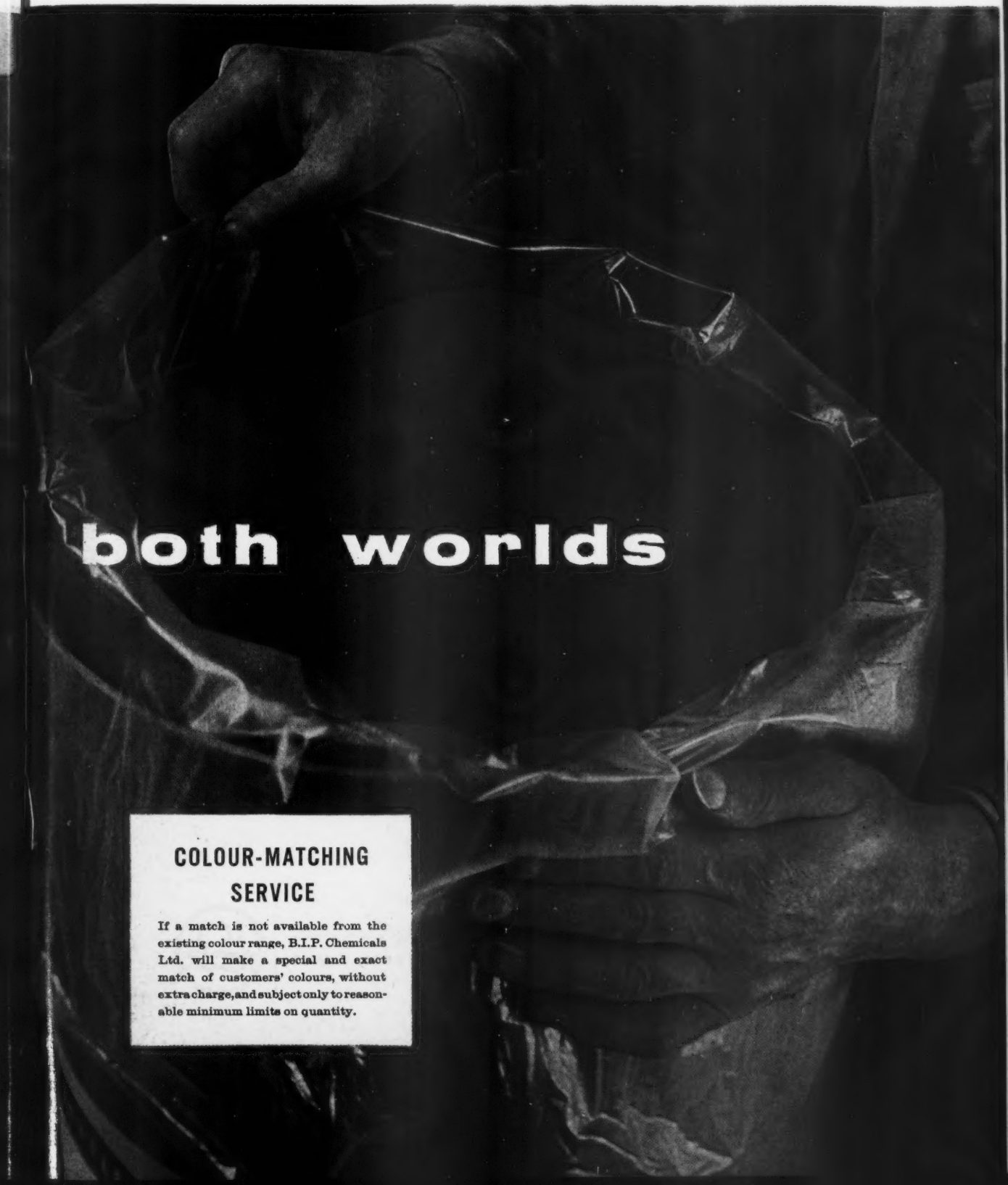
ALGEMENE KUNSTZIJDE UNIE N.V.

Plastics Department Arnhem (Holland)

B.I.P. Chemicals Ltd. provides the best of both worlds with the highest quality urea and melamine resins and moulding powders—and technical service facilities on an international scale which are second to none. Of special interest are the newer products—polyester resins for structural moulding, mineral-filled melamine and alkyd moulding powders; also the



most advanced Beetle Coating Resins and Melmex melamine moulding powder for moulding colourful, modern tableware. B.I.P. Services include a fully-staffed Product Design Unit and Mould Design advisory service to assist moulders in all aspects of creative and technical product design.



COLOUR-MATCHING SERVICE

If a match is not available from the existing colour range, B.I.P. Chemicals Ltd. will make a special and exact match of customers' colours, without extra charge, and subject only to reasonable minimum limits on quantity.

PHENOL

A high-quality synthetic product meeting the most stringent requirements of the plastics industry.

XYLENOLS

A grade of refined cresylic acid of distillation range approximately 215-230°C. Total tar acid content 99.5 to 100%.

Availability:

Ample supplies for prompt delivery in road tank-wagons and in 40/45 gallon drums.

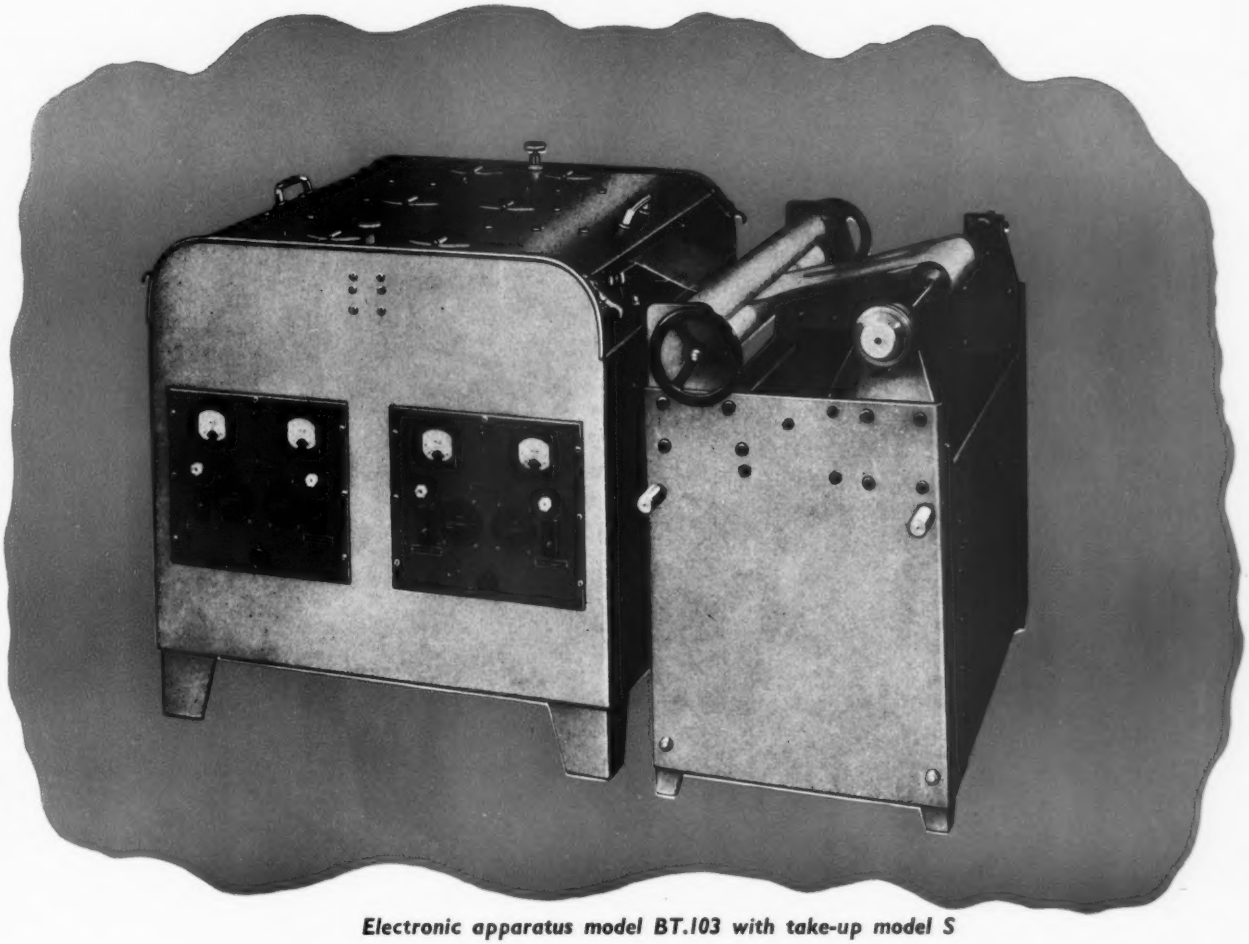
For further information, consult:

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

B.244

ICI

PRE-TREATMENT FOR PRINTING POLYETHYLENE



Electronic apparatus model BT.103 with take-up model S

S.C.A.E.

Società Costruzioni Apparecchi Elettronici

CASELLINA - FLORENCE - ITALY

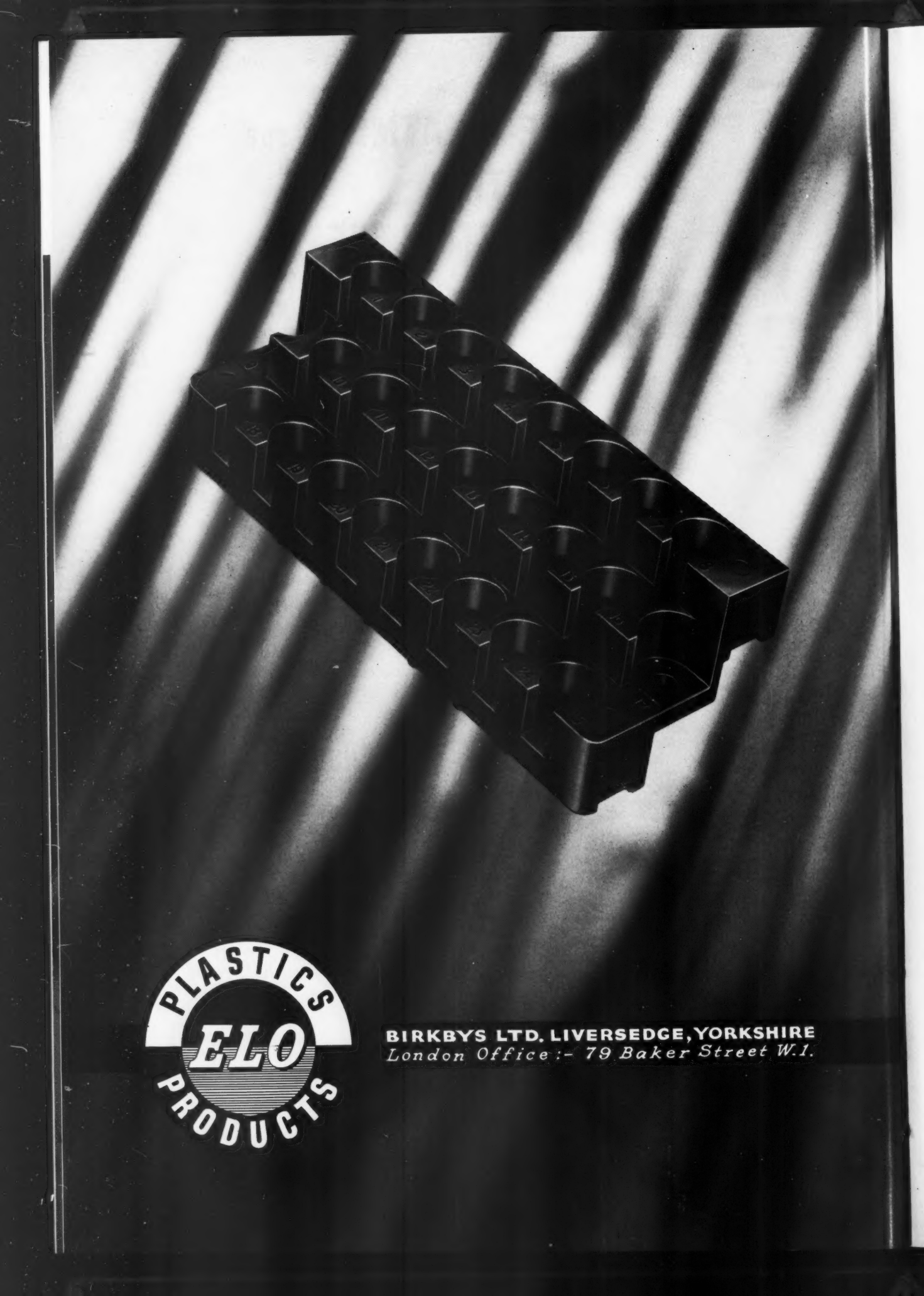
Representatives:

ED. BRAND LTD.,

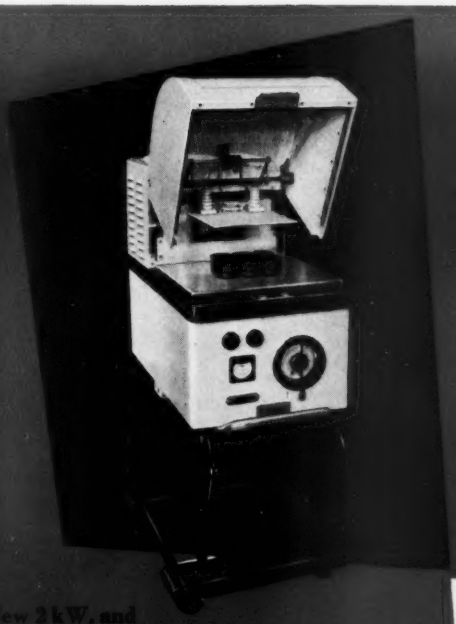
9, St. Cross Street,
London, E.C.1.

Telephone : Chancery 4091/3

D



BIRKBYS LTD. LIVERSEDGE, YORKSHIRE
London Office :- 79 Baker Street W.1.



RADYNE

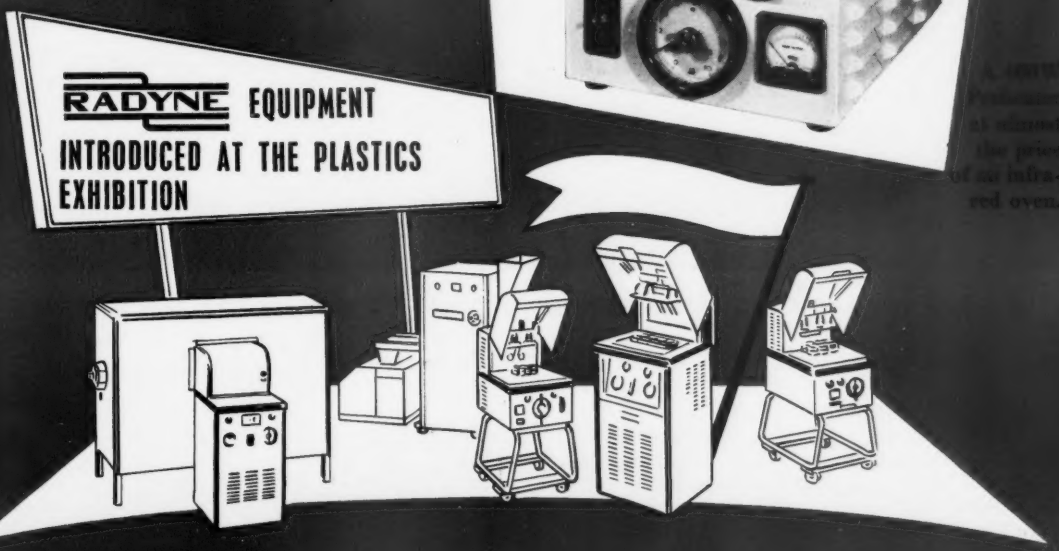
NEW PREHEATERS

RADYNE consulted British and American moulders before designing their new pre-heaters. The outcome is a completely new conception of pre-heating. By using 5 kW. in place of ¾ kW, production can frequently be doubled. With this basic thought RADYNE proudly announces a brilliant new range of compact high power pre-heaters at low power equipment prices.

New 2 kW. and 5 kW. Preheaters.

- Auto lid opening saves 1 second a lift — 1 week a year.
- Full interference suppression — G.P.O. tested.
- Fluorescent lighting illuminates easily viewed load.
- Full range includes 1 kW., 6 kW., 9 kW., 18 kW. and 28 kW. May we send you our new brochure.

A 1000W Preheater at almost the price of an infra-red oven.



radio heaters ltd

WOKINGHAM BERKS ENGLAND TELEPHONE WOKINGHAM 1030 (6 LINES)

P4226

Even if you're not interested in typewriter cases
its time you knew about Fibreglass Reinforced Plastics

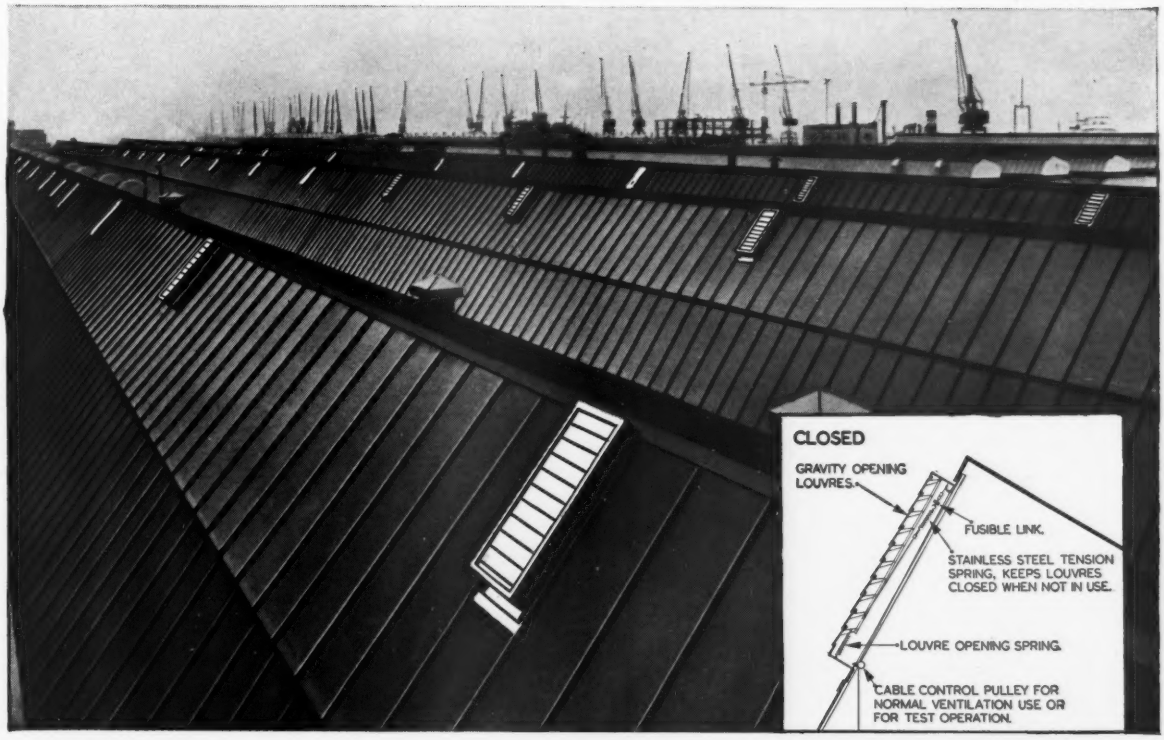
Cases, chairs, ducting, helmets, tanks—there's no limit to the applications of Fibreglass Reinforced Plastics. These versatile materials have so much to recommend them: lightness in weight, great impact strength, resistance to corrosion. Our new factory is fully equipped for all the latest processes for Fibreglass Reinforced Plastics mouldings—which explains why forward looking manufacturers everywhere are investigating the possibilities of Fibreglass Reinforced Plastics with Ashdowns. Our many years of experience in design and production techniques make it certain that it will always pay to

ask **Ashdowns**

Ashdowns Limited is a subsidiary of Pilkington Brothers Limited

Ashdowns Limited, Eccleston Works, St. Helens, Lancs. Tel: St. Helens 3206. London Office 29/30 St. James's St., London S.W.1. Tel: WHItehall 6002.

VENTILATION *AND* FIRE PROTECTION!


CLOSED
GRAVITY OPENING LOUVRES.
FUSIBLE LINK.
STAINLESS STEEL TENSION SPRING, KEEPS LOUVRES CLOSED WHEN NOT IN USE.
LOUVRE OPENING SPRING.
CABLE CONTROL PULLEY FOR NORMAL VENTILATION USE OR FOR TEST OPERATION.

with the COLT DUAL PURPOSE FIRE VENTILATOR

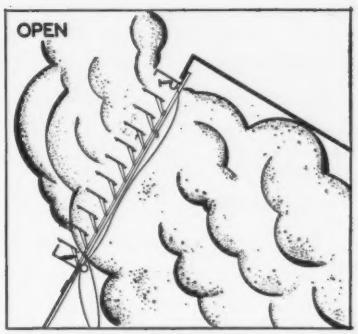
at AC-Delco, Division of General Motors Ltd., Southampton.

A study of industrial fires in Great Britain and in America has shown that the primary cause for the spread of fire is the super-heated air, smoke and explosive gases trapped under the roof. They build up in heat and intensity from the fire below and cause flash fires. Furthermore, the smoke rapidly extends downwards, entirely filling the premises and preventing the work of the fire fighters.

Colt have successfully solved this problem with the design of the Dual Purpose Fire Ventilator which **provides ventilation during normal conditions and—in the event of fire—functions as a heat and smoke exhaust.**

The installation of heat and smoke exhausts is standard practice in America and is rapidly being adopted by leading industrialists in the United Kingdom. Already, 1,290 Colt Dual Purpose Fire Ventilators have been installed in General Motors buildings in this country.

Write to Dept. AD9/8 for paper "Some Aspects of Fire Prevention in Industrial Buildings" by M. J. Reaney, which deals fully with this matter.



The insets illustrate the action of the ventilator as a Heat and Smoke Exhaust. In the event of fire, the fusible link fuses, providing Automatic Escape for Super-Heated Air and Smoke.

COLT VENTILATION

COLT VENTILATION LTD · SURBITON · SURREY

TELEPHONE: ELMBRIDGE 6511 (10 lines)

U.S.A. Subsidiary: Colt Ventilation of America Inc., Los Angeles.

Branches at: Birmingham, Bradford, Bridgend (Glam.), Bristol, Coventry, Dublin, Edinburgh, Glasgow, Liverpool, London, Manchester, Newcastle-upon-Tyne, Sheffield, and Warwick.

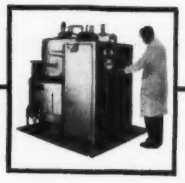
Agents in: Australia, Belgian Congo, Canada, Cyprus, India, Indonesia, Madagascar, Malaya, Mauritius, New Zealand, Pakistan, Portugal, North and South Rhodesia, and South Africa.

G579

E

short of steam?

You're not alone—there are thousands of steam users whose plant is unable to meet their various needs. Stone-Vapor steam generators provide the complete answer. In single or multiple installations, the output of these oil-fired " packaged " boilers modulates with the demand, giving the steam you want only when it is wanted, automatically; used as boosters with existing plant, they will competently smooth out load peaks. Completely self-contained, Stone-Vapor steam generators can be installed anywhere, quickly and easily. Consider their advantages; gross weight to evaporation ratio less than 1.5 to 1; steam in two minutes from a cold start; installation without break in production; reduced piping costs and line losses; less fuel and water consumed; great saving in manpower—*and constantly high efficiency at all rates of evaporation.* No investigation of modern steam plant can be complete unless you have details and have witnessed the performance of Stone-Vapor steam generators.



J. STONE & CO. (DEPTFORD) LTD. LONDON S.E.14 (TID 1202)

"Steady...
that's enough, thanks"

It is one thing knowing how much of a liquid you want. It may be another matter knowing where to get it.
When it's a question of ether and chloroform in quantity for industrial use, the source to rely on is the **M&B** range. The following are available:

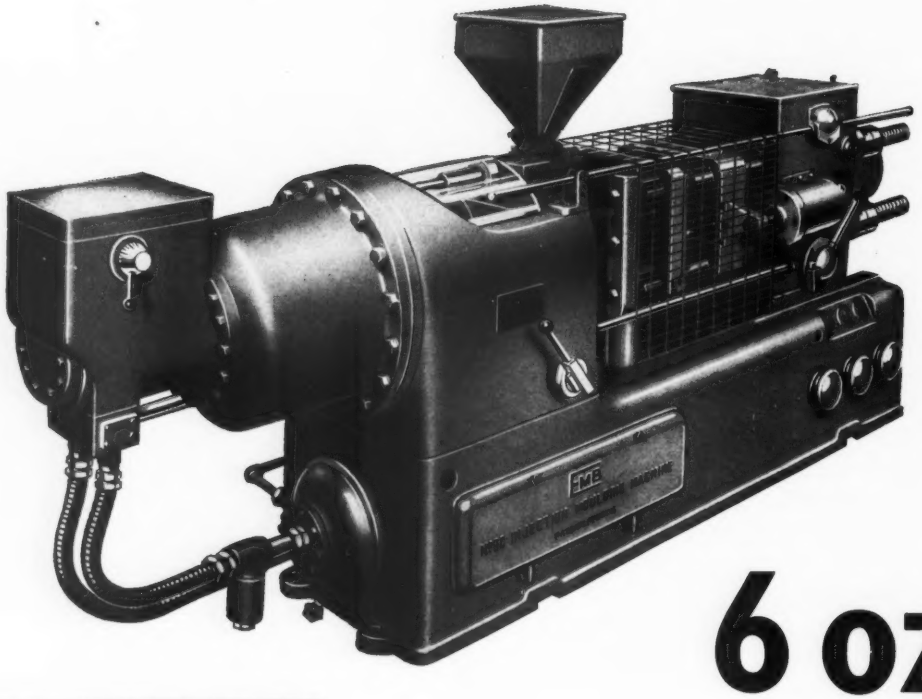
M&B *brand*
INDUSTRIAL CHEMICALS

ETHER B.P./B.S. 579 · ETHER ANHYDROUS
CHLOROFORM B.P. · CHLOROFORM TECHNICAL

ENQUIRIES TO
MAY & BAKER LTD · DAGENHAM
ILFord 3060 · Extension 319

IA987

EMB Nº 9c
Injection Moulder



6 ozs

EARLY DELIVERY

Distance between bars 11¾" × 10"

The E.M.B. No. 9c has 3 major characteristics:—

Reliability——————machine is continually at work with no loss of production due to "down time." The whole design of the machine inherently gives the utmost reliability.

Ease of maintenance—There are no electrical switches or timing clocks to need highly skilled attention—a good mechanic can do all that is necessary.

Accurate control of plasticising. The working temperature of the cylinder is maintained evenly by means of Kelvin and Hughes automatic temperature controller, which adjusts the amount of heat input automatically to the 5 heating zones to give a steady temperature.

Don't buy trouble——buy E.M.B.

E.M.B. Co. Ltd.

West Bromwich

England.

4 times

DE LA RUE

in the National Hall, Olympia

And every time something new; progress in plastics that will bring better living for everyone. Here are some of the latest developments in this field seen recently on the De La Rue stand at Olympia . . .

FORMICA* laminated plastic in new colours and patterns . . . new uses in furniture and fittings . . . new post-forming techniques.

DELARON* laminates for electrical and electronic insulation . . . printed circuits . . . mechanical and constructional applications.

DELARON* CHAIR SEATS in gay colours.

EXTRUDED PLASTICS. Polythene piping for all cold water services, extruded containers, and extruded plastics rod and tubing in CA, CAB and u-PVC.

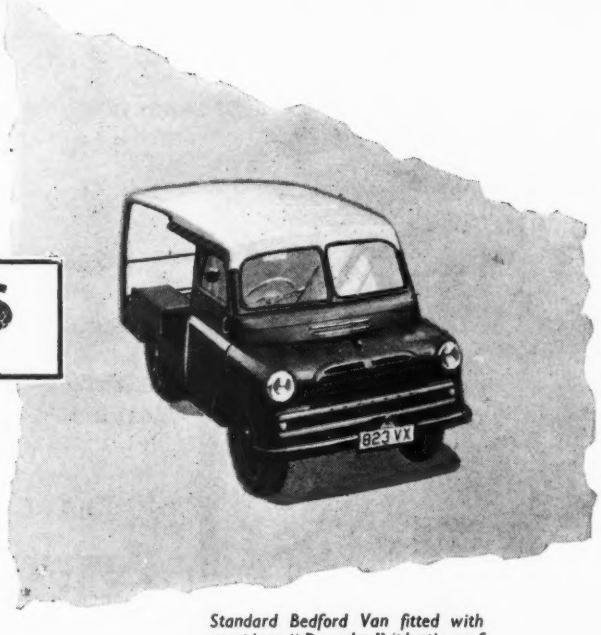
For full details, write to Thomas De La Rue & Co Ltd, Dept Z1, 84/86 Regent St, London W.

* 'FORMICA' *and* 'DELARON' *are registered trademarks*

Sports car body moulded by Martin Plastics Ltd., from "Duraglas" glass fabric bonded with "Bakelite" polyester resins.

The key to better plastics reinforcement

DURAGLAS
REGISTERED TRADE MARK



Standard Bedford Van fitted with one-piece "Duraglas"/plastic roof panel by R. W. Osborne & Son.

You can keep down the weight—and the cost—yet keep up the strength with "Duraglas" glass fibre reinforcements for constructional plastics. "Duraglas" can be used whenever a combination of lightness with strength and durability is desirable. Both the sports car and the van illustrated are fine examples of the use of plastics in modern bodybuilding, employing "Duraglas" glass fibre reinforcement. We shall be glad to supply further details and samples.

TURNER BROTHERS ASBESTOS CO. LTD. ROCHDALE ENGLAND
A MEMBER OF THE TURNER & NEWALL ORGANISATION

dmTA18

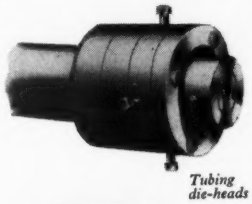
GENERAL
plastic extruders

sizes $1\frac{1}{2}$", $2\frac{1}{2}$", $3\frac{1}{2}$", $4\frac{1}{2}$"

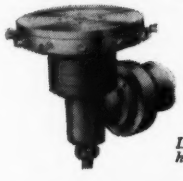
Continuous rating, with oversize gears and bearings ★
Externally mounted motor with adequate power ★
Electric heating with separate control panel ★
Water-cooled screw and feed box ★
Barrel cooling if required ★
Smooth running with no vibration ★
Screws and die-heads designed to suit duty ★
Easy access for cleaning and maintenance ★
Screw-speed indication ★
Feed box temperature indication ★

Illustrating Plastic Extruder Type XT

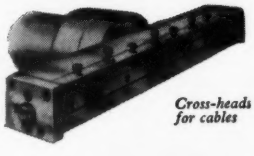
separate control panels and full range of auxiliary equipment available



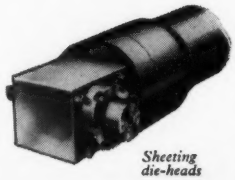
Tubing die-heads



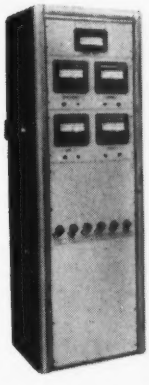
Lay-flat heads



Cross-heads for cables



Sheeting die-heads



Separate temperature control panel incorporating proportioning instruments, relays, etc.

Die-head assemblies for piping, sheathing, sheeting, stranding, belting and lay-flat.

Consult us about your plastic and rubber extrusion problems. Our technicians and laboratory facilities are at your service.

Detailed Bulletin 300 sent on request.

GENERAL ENGINEERING CO (RADCLIFFE) LTD.

STATION WORKS, BURY ROAD, RADCLIFFE, LANCS., ENGLAND.
Telephone: Radcliffe 2291 (3 lines). Telegrams: " General " Radcliffe.
London Office: 9 Victoria Street, S.W.1. Telephones and Telegrams: ABBey 5278.
Birmingham Office: Guildhall Building, Navigation Street, Birmingham, 2. Telephone: MIDland 7797.
Represented in Australia, Austria, Denmark, Finland, France, Italy, Norway, Sweden, U.S.A., Yugoslavia.

all over

for this year

BUT—

—But this is no time to relax. Orders mean production; production means planning. And when planning for *long* runs, remember to order a mould designed and built to stand up to its task—the arduous task of producing perfect parts from beginning to end, without trouble and without failure, for a long time.

This means a mould embodying good design, skilled workmanship and, above all, *experience;* in short, a tool of the type in which we specialise. And the cost? Well, a good mould is cheaper—in the long run.

UNIVERSAL

TOOLMAKERS TO THE PLASTICS INDUSTRY

TOOLS LTD

TOOL MAKERS GAUGE & ASSOCIATION MEMBER

TRAMWAY PATH, MITCHAM, SURREY. Tel.: MITcham 6111

We've got a move on!

And a good move it is, too! We've left our old home and are now reassembled in the most modern plastics factory in Europe. If ever you're in the vicinity with an hour or so to spare, drop in for a chat and a rewarding look around.

you'll be welcome at

Here we have the very latest injection moulding equipment. We take orders for the most intricate mouldings in our stride, as well as make millions of Platignum pen barrels each year. What's more, you'll find we've quite a thing about precision . . . and come to think of it, our delivery dates are pretty accurate too!

yes, things are shaping well at

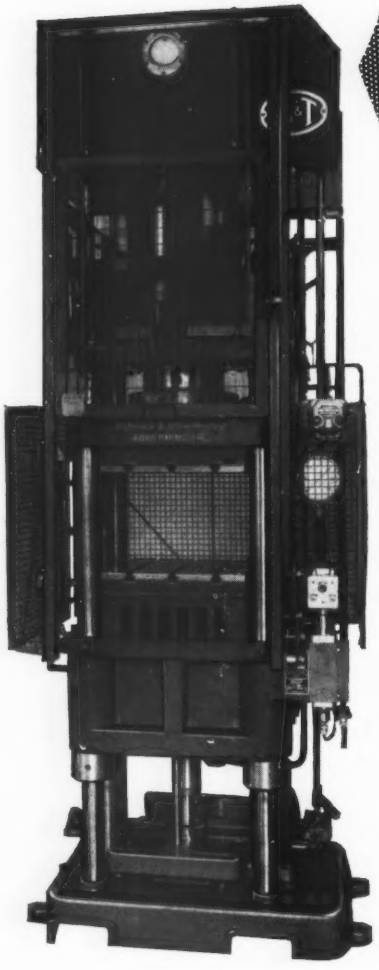
Mentmore Plastics

Mp

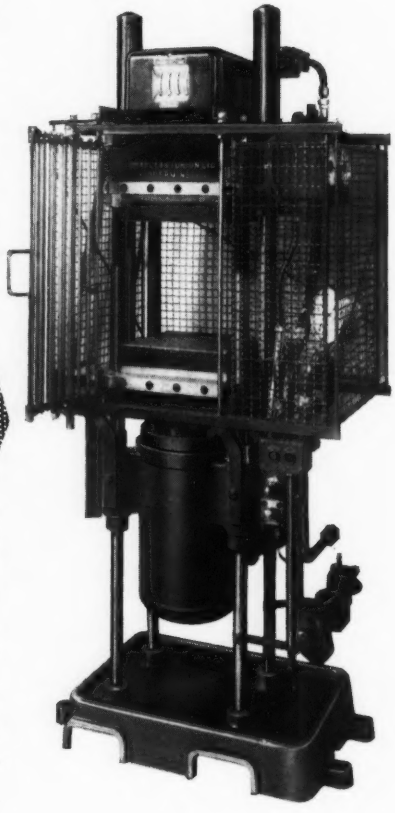
another **Platignum** *enterprise*

B&T

PROCESS CONTROLLED HYDRAULIC PRESSES



936 150-ton self-contained semi-automatic ejection type Downstroking Hydraulic Press with motor-driven pump unit, electric-heated platens and operator guards and fitted with type EL/A push - button operated Process Controller and alternative manual control.



501A

25 - ton Upstroking Hydraulic Press with electric - heated platens and operator guards and fitted with type EL/A push - button operated Process Controller. Suitable for operating with a self - contained Pump Unit or off an accumulator supply.

Bradley & Turton Ltd

CALDWALL WORKS KIDDERMINSTER

TELEGRAMS : "WHEELS" KIDDERMINSTER TELEPHONE : 2217/8

Birmingham Office

13, SOHO ROAD, HANDSWORTH, BIRMINGHAM, 20. TELEPHONE: NORTHERN 2519

THE LEADING MANUFACTURERS OF COMPRESSION MOULDING EQUIPMENT

Adhesives

Surface coatings

Potting resins

Casting resins

Fillers

Glass fibre laminates

Patterns and moulds

Tooling resins

Fresh Fields . . .

Araldite epoxy resins, probably the most versatile materials developed in recent years, are now widely used for the production of jigs, fixtures and press tools. Their advantages for these applications include: negligible shrinkage on curing; exceptional dimensional stability; accuracy of reproduction; negligible machining or hand finishing required; toughness and durability; low production costs; low weight and ease of handling; resistance to cutting-oils and die lubricants.

May we send you our new publication on Araldite tooling resins and other literature describing the uses of these versatile epoxy resins?

Araldite

epoxy resins

Araldite is a registered trade name

Aero Research Limited

A Ciba Company

Duxford, Cambridge. Telephone: Sawston 2121

AP352

this Flourishing Plant . .

. . plasticus multiflora

shows typical varieties of mouldings produced from blueprint seeds at our factory in Coventry.

Quantity production available for mouldings, pressings, extrusions for all industries at down to earth prices.

COVENTRY MOTOR AND SUNDRIES CO. LTD.

SPON END COVENTRY • TEL: COVENTRY 40363-4

Ask Berk for P.V.C. Stabilisers

OUR Associate Company, Abbey Chemicals Ltd., will shortly be producing commercial quantities of the following range of P.V.C. Stabilisers at their plant at Stratford, London, E.15.

* **TRIBASE** - -	Tribasic lead sulphate. An unequalled heat stabiliser and the best stabiliser for primary electrical insulation.
* **DYPHOS** - -	Dibasic lead phosphite. An outstanding light and weather stabiliser.
* **DS-207** - - -	Dibasic lead stearate. Has synergistic effects with TRIBASE and DYPHOS. A lubricant-stabiliser for vinyl records.
* **CLARITE** - -	Barium cadmium complexes.
and * **PROVINITE** -	Barium cadmium complexes. Combine excellent heat stability, light stability and clarity.

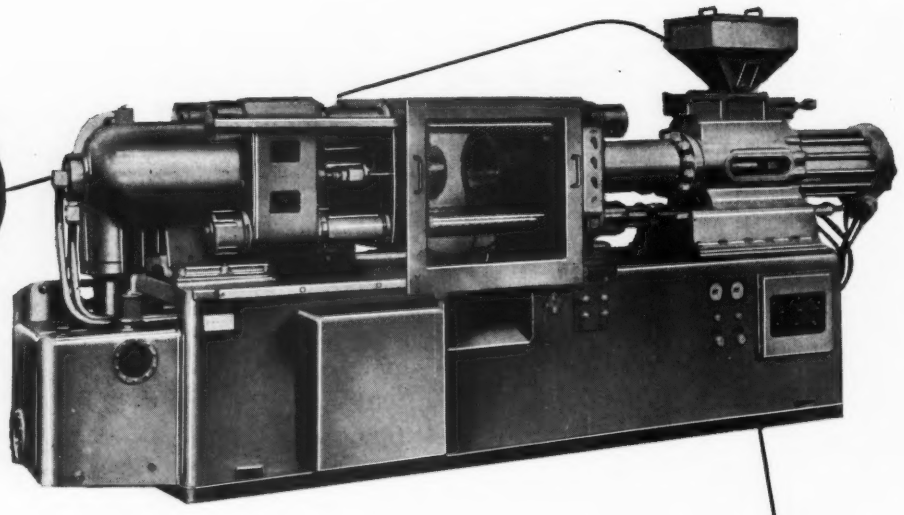
*Trade Marks

Please apply to us now for experimental quantities, technical information and literature

F. W. BERK & CO., LTD. 1-19 New Oxford St. London, W.C.1

Telephone: CHAncery 6041

INJECTION MOULDING PRESSES



These machines mean BUSINESS for you

INJECTION PRESSES

All " NB " presses, like the NB. 360/520 shown here (12-19 oz.), are self-contained with the oildynamic power drive unit incorporated into the machines. The progressive electric system, featured by all " NB " presses, makes operation simplicity itself and cuts maintenance to a minimum. Main components are easily interchangeable. All machines are fitted with safety devices.

Injection presses "RAPID" full automatic

NB & Co. are leading in automation of plastics equipment and are mass-producing the " Rapid " 1-, 2-, 4- and 6-oz. models, which operate by themselves on fully automatic fast cycling.

EXTRUDERS

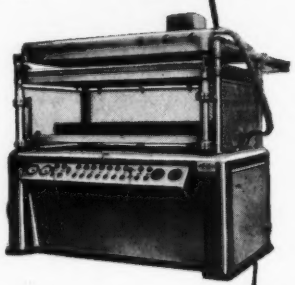
" NB " single-screw extruders are available in " Standard " models with 30-, 45- and 60-mm. screw diameters; in the " TV " series, with built-in speed variator, with 45-, 60-, 70- and 90-mm. screw diameters. Screws and die heads are available in a wide variety of designs for all sorts of extrusion jobs such as: tubing, profiles, wire coating, monofilaments, and are completed by full equipments for the extrusion and blowing of P.V.C. and Polyethylene tubular films.

EXTRUDERS AND EQUIPMENT

"VUOTOPLAST" Vacuum Forming

Here is something really sensational !
" NB & Co." introduce vacuum formers with patented movable and adjustable infra-red heater elements, that concentrate heat where it is most needed, thus ensuring constant cross-sections throughout the formed pieces and permitting extremely deep draws.
" Negri Bossi & Co." build both, automatically operated machines as well as cheaper " Standard " models that, however, still maintain a high productivity level.

VUOTOPLAST VACUUM FORMING



Write for detailed information and descriptive literature now !

Negri Bossi & C.
MILANO (ITALY)
44, CORSO MAGENTA
Cable address: "GIANIMAR"

NB&C

Sole Distributors:

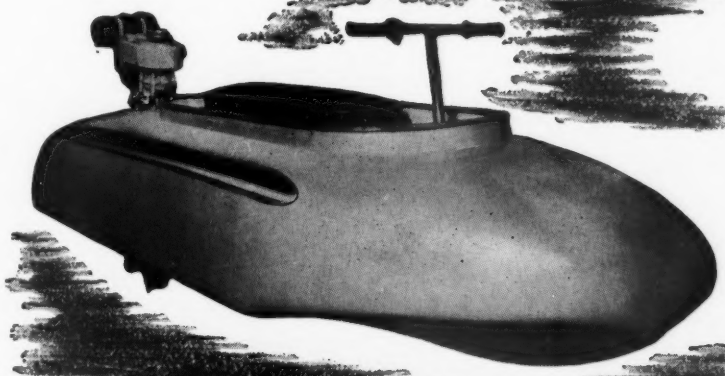
ARGER (MACHINERY) LIMITED

CRAVEN HOUSE · 121 KINGSWAY · LONDON · W.C.2 · *Tel.: CHAncery 4188/9.*

BAKELITE Polyester Resins REGD. for modern boat design

These sleek, modern craft are excellent examples of the many new boats being produced from BAKELITE Polyester Resins reinforced with glass-fibre. Superior strength and durability, light weight, ease of fabrication and virtual elimination of the need for maintenance are among the advantages of these modern materials.

RIGHT. The "Dreamboat" made by Willerby Plastics of Willerby, Yorks. The Company make an extensive range of small craft—all from BAKELITE Polyester Resins.



LEFT. This new water scooter is being produced in quantity by Tidemaster Motors Limited of Deal, Kent, and incorporates BAKELITE Polyester Resins in its hull construction.

BELOW. The "Cea-Dinghy 9", made by Ceacraft of Solihull, one of a number of craft made by this Company using BAKELITE materials.

Write for information or advice on fabricating methods using BAKELITE Polyester Resins and glass-fibre materials. Manufacturers and designers are invited to consult our technical experts.

BAKELITE LIMITED

REGD.

12-18 GROSVENOR GARDENS · LONDON · SW1 SLOane 0898

Bakelite Limited manufacture an extensive range of plastics materials and maintain a technical service unequalled in the industry. No matter what your plastics problems this service is at your disposal. SLOane 0898 is the telephone number.

TGA RP11A

HIGHLIGHTING
the new Polythenes

In this plastics' conscious age, G.E.C. technologists are at all times considering to what use can best be put the new developments in materials. With more than 40 years' experience in producing injection and compression mouldings for a wide range of industries at home and overseas, the G.E.C., backed by laboratory and test facilities, is at your service to give advice on your problems.

To meet M.O.S. requirements for improved heat resistance and increased impact strength at normal and low temperatures, the new rigid Polythene material is used for moulding the various component parts of the right-angled torch.

G.E.C.

moulded plastics for industry

THE GENERAL ELECTRIC CO LTD MAGNET HOUSE · KINGSWAY · LONDON · W.C.2

– WHEN THEY'RE BOTH MADE FROM

More and more manufacturers are choosing colourful Cellastine, the versatile acetate sheeting, for better results—and that means finer finish, perfect detail and greater depth of draw. The ideal plastic for vacuum-forming and other specialised methods of production, Cellastine is backed by the unrivalled experience and know-how of the Celanese Plastics Division.

Cellastine
TRADE MARK

● *Vacuum-formed dispenser by R. A. Goodall & Co. Ltd.*

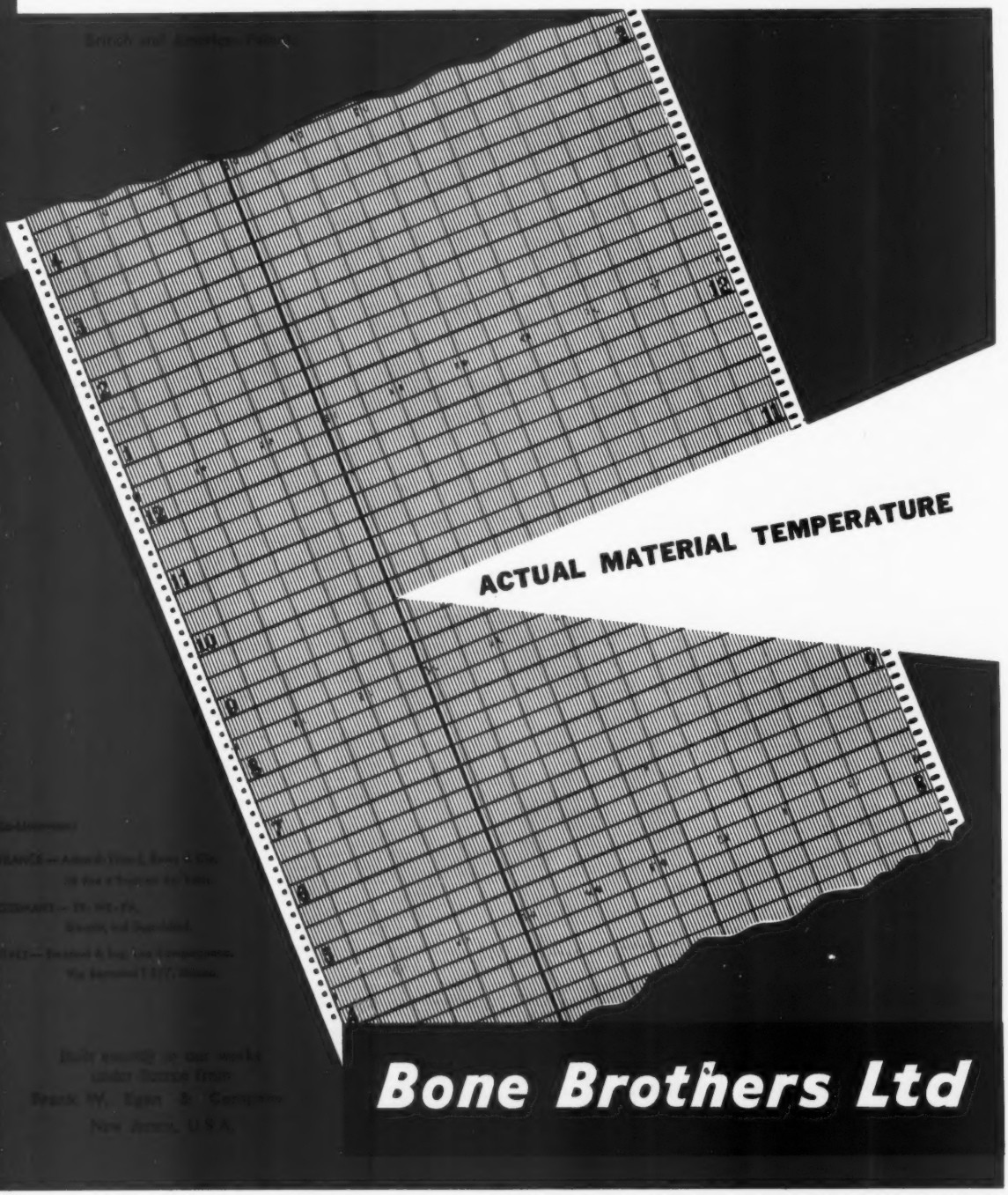
● *Beau Garde mudguards by B and T (Essex) Ltd.*

BRITISH CELANESE LIMITED · PLASTICS DIVISION
CELANESE HOUSE · HANOVER SQUARE · LONDON · W.1

F

PLASTICS EXTRUDERS

with WILLERT VAPOUR PRESSURE COOLING SYSTEM

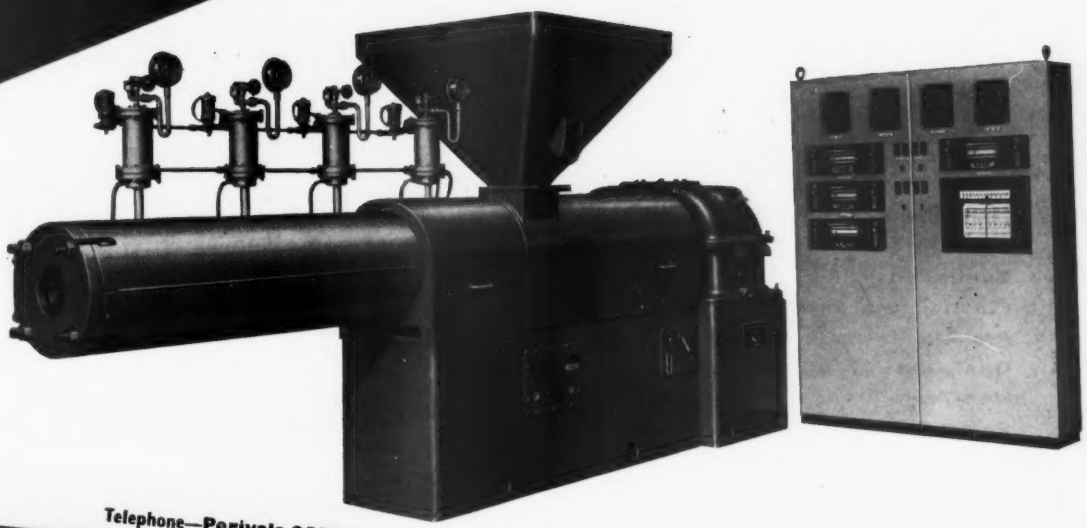


Bone Brothers Ltd

Designers and Constructors of Machinery for the Plastics Industries

Bone Brothers Ltd

★ *Write for our descriptive leaflet*



Telephone—Perivale 9555/7

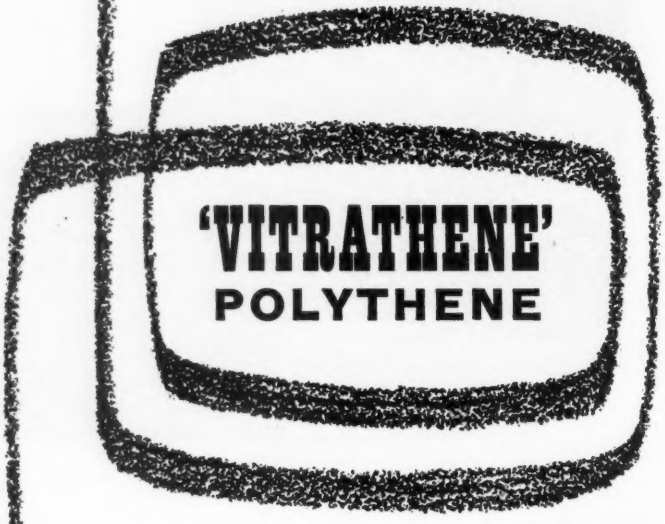
Telegrams & Cables—Bonebrolim, Wembley

Close Tolerance Extrusions

are produced quickly and easily by these extruders which are made entirely in our works. They are *the only* extruders available with an automatic temperature balancing system which *also provides* a quick cooling feature *without pumps, blowers or compressors.*

The pen recorder chart on the left shows the actual material temperature indicated and recorded during a typical day's production run—not a carefully controlled laboratory test.

MANOR FARM ROAD, ALPERTON, WEMBLEY, MIDDLESEX



'VITRONE'
Rigid & Flexible
Continuous Film,
Plastic/Metal Laminates,
Pressed Sheets including
Opal, Glass Clear and
Non-Toxic Grades,
Petrol Resistant Grades.
Extrusions,
Clear non-toxic tubing,
Petrol Resistant Grades.

'VITRATHENE'
Sheets, Rods,
Tubes & Blocks,
Extrusions,
Cold Water Tubing.

STANLEY SMITH & COMPANY
WORPLE ROAD • ISLEWORTH • MIDDX • HOUNSLOW 3406
TELEGRAMS: STANMITH • PHONE: LONDON

Here's a new and colourful brochure with a wealth of information on the immense number of uses to which I.E. Plastics are daily being put

INSULATION EQUIPMENTS LTD

OSWESTRY · SHROPSHIRE

TEL: OSWESTRY 790-1
GRAMS: INSULATION OSWESTRY

We invite your application for copies.

PA-F

safe—can't break dangerously
unlimited colours
non-toxic
no fire risks
long-lasting

Another toy. Another new favourite. But this one will last: this one's made with Courtaulds' Cellulose Acetate moulding powders. Which means smoother mouldings, sharper details, clearer colours—and safer, more durable toys: for cellulose acetate never breaks dangerously, always stands up to punishment. That's why it's Top Dog!

Courtaulds

cellulose acetate moulding powder

Courtaulds technical service welcomes your enquiries about any aspect of plastics

Plastics Division Little Heath, Coventry. *Telephone* Coventry 88031.
16 St. Martin's-le-Grand, London EC1. *Telephone* MONarch 8811.

Overseas Distributors
Lustre Fibres Ltd., PO Box 65, Coventry, England.

EUROPE'S LEADING SPECIALISTS IN TECHNICAL GRADES OF PVC FILM

NOW MADE IN BRITAIN

'CRAYTHERM'

NON-TOXIC

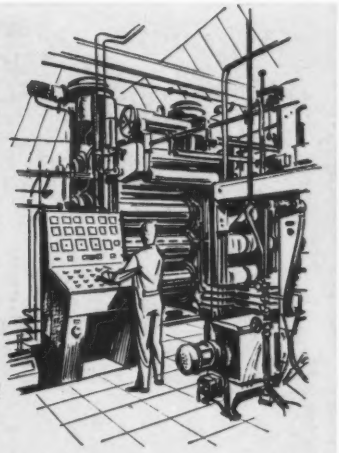
Unplasticised PVC film

Manufactured by the **'LUVITHERM'** process

For the first time, you can obtain from Britain this important type of PVC film. 'Craytherm' has many new and remarkable properties. Of special value are its great strength and resistance to chemical action, which make it suitable for almost unlimited applications. Being non-toxic and odourless it is especially suitable for food packaging.

The NON-TOXIC packaging film for fatty foods

Vacuum formed packs for cooked and uncooked foods. Decorative trays for confectionery and candies. Packs for cosmetics, drugs and baby food.



PLANT IN BRITAIN PRODUCES CRAYTHERM TO THE MOST EXACTING STANDARDS

'Craytherm' is made in two types:

U A normal unstretched film, available in thicknesses from .0012 to .0079 in.

S A film orientated lengthwise to give a higher longitudinal tensile strength. In thicknesses from .001 to .0016 in.

'Craytherm' can be clear, opaque or coloured or embossed, and printed by photogravure, silk screen or letterpress.

'Craytherm' is excellent for vacuum forming.

'CRAYLENE'

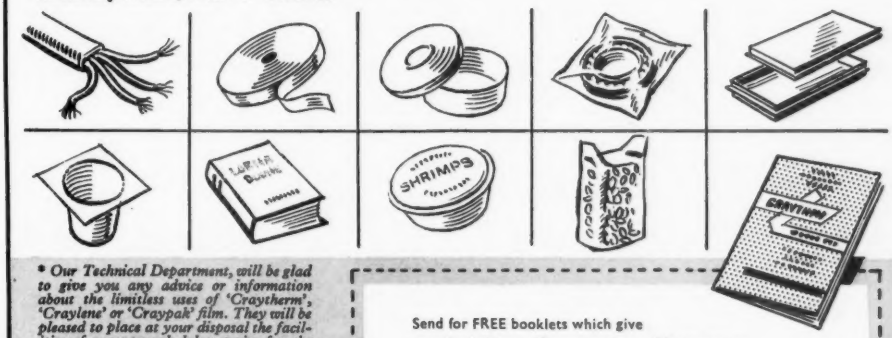
All purpose vinyl packaging film protects goods of all kinds from dust, damp, and atmosphere impurities. Excellent for drum liners and chemical packs. Special formulations for pressure sensitive adhesive tapes and pharmaceutical strappings and dressing, and for specific applications

'CRAYPAK'

Clear, lightweight, PVC packaging film.

A film that combines exceptional strength with thinness and light weight. It has excellent dielectric and chemical properties. Crystal clear or in opaque and translucent colours. In sheeting or lay flat tubing.

Electrical insulation, sound recording tapes, pressure sensitive adhesive tapes. 'Camelback' sheeting for motor tyre trade. Backing strip for surgical tapes. Stationery folders, book and leaflet covers, children's books. Laminated materials. 'Craytherm' can be laminated to paper, metal foils, and other films. Lampshades, plain or embossed, in attractive colours.



** Our Technical Department, will be glad to give you any advice or information about the limitless uses of 'Craytherm', 'Craylene' or 'Craypak' film. They will be pleased to place at your disposal the facilities of our research laboratories for the development of new applications.*

A Greenwich PRODUCT

Send for FREE booklets which give you the full facts. Cut out and post this coupon to Greenwich Plastics Ltd., Sales Department, St. Mary Cray, Kent, England.

NAME .....

COMPANY .....

ADDRESS .....

®

GREENWICH PLASTICS LTD *St. Mary Cray Kent England*

Telephone Ravensbourne 4674/5 and Orpington 25671/2/3

DO YOU PLAY YOUR LUCK?

Of course you have to play a hunch now and again, life's like that. And good luck to you—so long as you never leave vital things like choosing injection moulding and extrusion materials to chance. There's no excuse for anything but accuracy there—and there's little doubt you'll find the polystyrene that's 100% right for the job in the Kleestron range. Why not take advantage of our experience and resources—and find out? All you have to do is write or phone us: Kleestron Limited, West Halkin House, West Halkin Street, London, S.W.1. Tel: SLOane 0866.

Kleestron

make a comprehensive range of general polystyrenes and impact materials—and will gladly supply technical details, prices, etc.

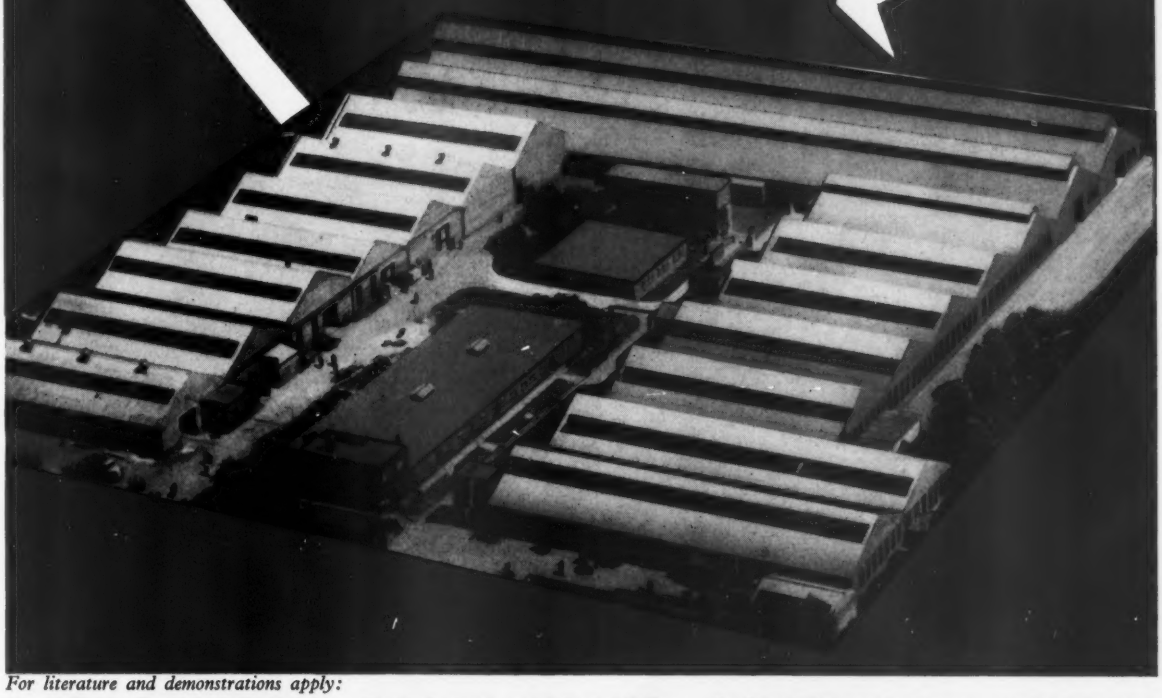
BURTONWOOD - ANDOUART EXTRUSION EQUIPMENT

is now being produced by

BURTONWOOD ENGINEERING CO. LTD.

All types of extrusion machinery for the Cable and Plastics Industry

Extruders • Pay-offs • Capstans • Take-ups • Dipers • Granulators • etc.



For literature and demonstrations apply:

BURTONWOOD ENGINEERING COMPANY LIMITED

Burtonwood, Warrington, Lancashire *Telephone: Newton-le-Willows* 3311 (10 *lines*)

Sole Selling Agents:

WARBRICK (ENGINEERING SPECIALITIES) LTD. Barclays Bank Chambers, Sankey Street, Warrington. Telephone: Warrington 4081

announcing
Ralsin
R

Ralsin

(Registered Trade Name) **(NYLON II)**

This is what Ralsin provides

In all its forms, for every application and product, whether injection moulded, sprayed, extruded or as filament.

Unequalled Mechanical Properties

Ralsin, being a polyamide, has abrasion resistance, tensile strength and shock resistance characteristics unequalled by any other member of this class.

Ease of Manipulation

Various grades are available which can easily be moulded, extruded, spun or applied by spraying and dipping.

Low Specific Gravity

Ralsin is the lightest polyamide (S.G. 1·04). This, combined with excellent mechanical properties, permits the production of thin mouldings and light-weight mouldings.

Dimensional Stability

At all relative humidities, Ralsin absorbs very little water. Its dimensional stability is therefore guaranteed and permanent.

Infinite Colours

Whatever its form (moulding granules, bristles, mono-filaments, fine powder), Ralsin can be coloured brightly and vividly, to the exact shade required.

Excellent Chemical Resistance

Ralsin is resistant to most chemicals and is available in 'food' grades. Packages and bottles made from Ralsin can be sterilised.

By **WHIFFENS**

Industrial and Pharmaceutical Chemical Division of Fisons Limited

WHIFFENS & SONS LTD.,
FISON HOUSE,
95 WIGMORE STREET, LONDON, W.1
TELEPHONE: WELBECK 5500
TELEGRAMS: WHIFFEN, WESDO, LONDON

Manufactured in France Under the Trade Name Rilsan, by SOCIETE ORGANICO, 23 Avenue Franklin Roosevelt, Paris 8e.

W14

Papers for Industry

Base Papers for Plastics, Abrasives, Oil and Air Filters

Leathercloth and Impregnation or Coating

WIGGINS TEAPE have always been in the lead in developing special papers for industrial use. With their research staff and laboratories, quality control instruments on the papermaking machines, coupled with the skill and know-how of their papermakers, Wiggins Teape welcome enquiries for specialized industrial papers.

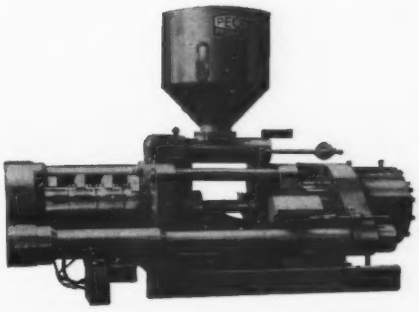
THE WIGGINS TEAPE GROUP

Gateway House 1 Watling Street
London EC4 · City 2020

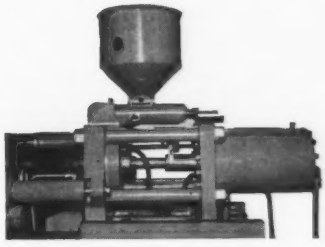
Peco

½ oz. to 160 ozs.

This fine up to date range of machines includes the **IN-LINE** Preplasticiser for close control of critical moulding factors; the increased plasticising capacity of the **THERMAX** chamber ensures faster injection speeds. Both types of machine are designed to operate with a standard locking Unit and will meet the demands of the most discriminating moulder.



THE PECO IN-LINE PREPLASTICISER

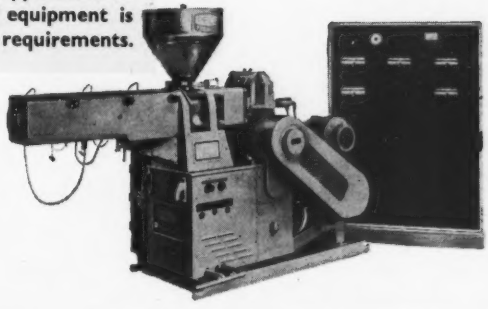


THE PECO THERMAX PLASTICISING CHAMBER

for a better quality product at lower cost

extrusion machines

PECO Extruders are universally recognised for their robust design and versatile application. A comprehensive range of take off equipment is available to cover most production requirements.



Illustrated literature and full specifications will be sent on request

PECO MACHINERY SALES (Westminster) LTD., 28 Victoria Street, London, S.W.1. Tel: ABBey 1793
WORKS: THE PROJECTILE AND ENGINEERING CO., LTD., Thessaly Road, London, S.W.8

PECO PRODUCTS

For underlying excellence in good designs

CALOFIL

P.C.C. FILLERS

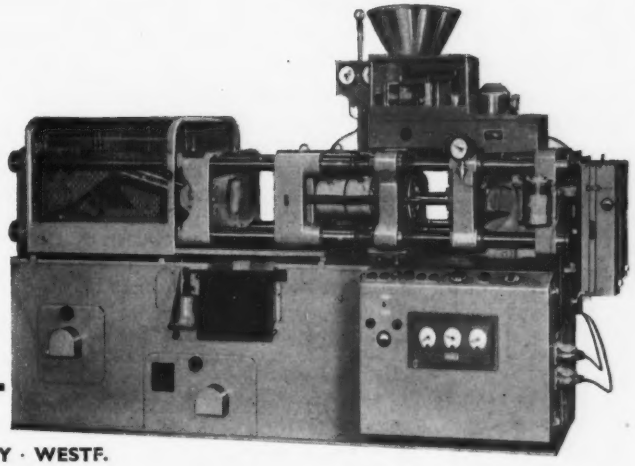
JOHN & E. STURGE LIMITED

WHEELEYS ROAD, BIRMINGHAM 15. TEL: MIDLAND 1236

TGAPCC 6

Injection mouldings such as these have been produced on a BATTENFELD fully automatic BSM 100 S, developed for the Plastics industry as a fast-cycling machine with high output.
The BSM 100 S is especially economical in that it is directly connected to the electric supply. Energy consumption is only about 5 kW per hour.

BATTENFELD Injection Moulding Machines from ¼ to 50 ounces for thermoplastic materials.



BATTENFELD

MASCHINENFABRIK · MEINERZHAGEN · GERMANY · WESTF.

For particulars please apply to our agents:

Ed. Brand Ltd., 9, St. Cross Street, Hatton Garden, London, E.C.I

Telephone: Chancery 4091 (3 lines) Telegrams: Wyrellous, London

The hands that work so sensitively, so meticulously . . . the hands that control the most modern toolmaking machinery . . . these are the hands of the Craftsmen of Tyburn Road. These are the hands that build the finest moulds made in Britain, of which many leave these shores to serve the plastics moulding industries across the seas . . .

B.I.P. TOOLS LIMITED

Tyburn Road, Erdington, Birmingham, 24

Tel: Birmingham East 2061

The Craftsmen of Tyburn Road

Member of The Gauge and Tool Makers Association

Grilon
NYLON 6

THE VERSATILE POLYAMIDE PLASTIC

The modern Grilon works and laboratories at Domat/Ems, Switzerland

"Made in Switzerland"

synonymous with

Quality

Manufactured by

Holzverzuckerungs A.G., Zurich.

Deliveries can be made ex-stock London from our exclusive Representative in U.K.:—

for

- ★ **INJECTION MOULDING** —the fastest moulding cycles
- ★ **EXTRUSION** —the widest viscosity range
- ★ **HIGH TEMPERATURE RESISTANCE** —heat stabilised grades
- ★ **COLD TEMPERATURE RESISTANCE** —cold stabilised grades
- ★ **CABLE COVERING** —various qualities
- ★ **SPECIAL APPLICATIONS** —special grades
- ★ **MONOFILAMENTS** —bristles, fishing lines, etc.
- ★ **RODS & SHEETS** —machining

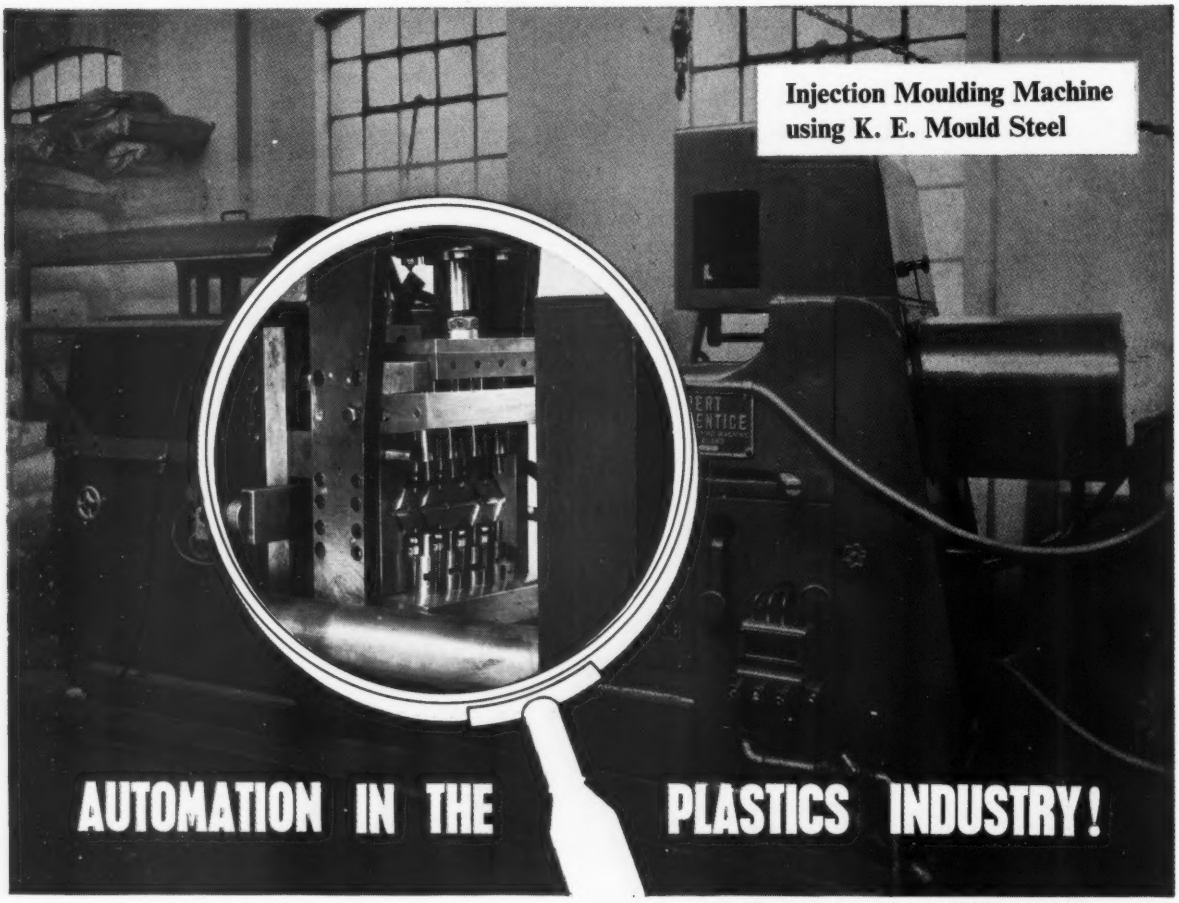


Illustration by courtesy of Wolseley Engineering Ltd.

REPEAT ORDERS ARE USUALLY AUTOMATIC ONCE (KE) HIGH GRADE MOULD STEELS HAVE BEEN USED

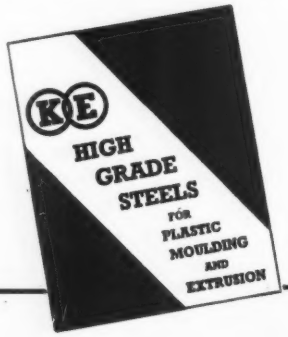
(KE) 355 Special Nickel Chrome Molybdenum Oil or Air Hardening Mould Steel.

(KE) 961 1½% Carbon 12% Chrome High Duty Mould Steel.

(KE) A28 Special Stainless Mould Steel.

Melted to close limits of analysis. Forged with an adequate reduction of area from the ingot to ensure the maximum amount of grain distortion. Carefully annealed to give optimum machinability and grain refinement. Ultrasonically inspected prior to despatch. These factors and almost one and a half centuries of steel-making experience give our Steels a high degree of regularity and reliability. These Steels have great strength and do not distort under the high pressure of injection moulding.

This booklet, giving greater detail, is available free on request.



KAYSER ELLISON & CO. LTD

CARLISLE STEEL WORKS · SHEFFIELD · ESTABLISHED 1825

we hold the stage

" *Explain yourself.*"
" With pleasure! See that shield?"
" *Well?* "
" It's made from 'Mirralon'. Looks just like metal, doesn't it? "
" *Amazing!* "
" Observe that coat of mail? Made of 'Meculon' thread."
" *Go on.*"
" There is also the sword. There are the sequins on the lady's dress; not to mention her looking glass (unbreakable, of course). Added to these, there are — "
" *All right, all right! The achievement reflects great credit on you. Now let's have a few straight facts.*"
" Certainly, my dear fellow. At Dagenham we are now metallizing plastics films to produce two new products —

'MIRRALON'* is metallized cellulose acetate film for making sequins, dress ornaments, unbreakable mirrors and for general display purposes. It is well suited to vacuum forming processes.

'MECULON'* is metallized polyester film for tinsels, ribbons, thread, electrical condensers, and a host of other things. It can also be laminated to leather cloth and p.v.c."
" *Is that all?* "
" Not by any means. For further information apply to the distributors."

M&B PLASTICS LTD

45/47 WIGMORE STREET · LONDON W.1 · TELEPHONE: WELBECK 0425

**trade mark*

'MIRRALON' and 'MECULON' are manufactured by **MAY & BAKER LTD** · DAGENHAM · ENGLAND

PLA104

Bridge-Banbury MIXERS

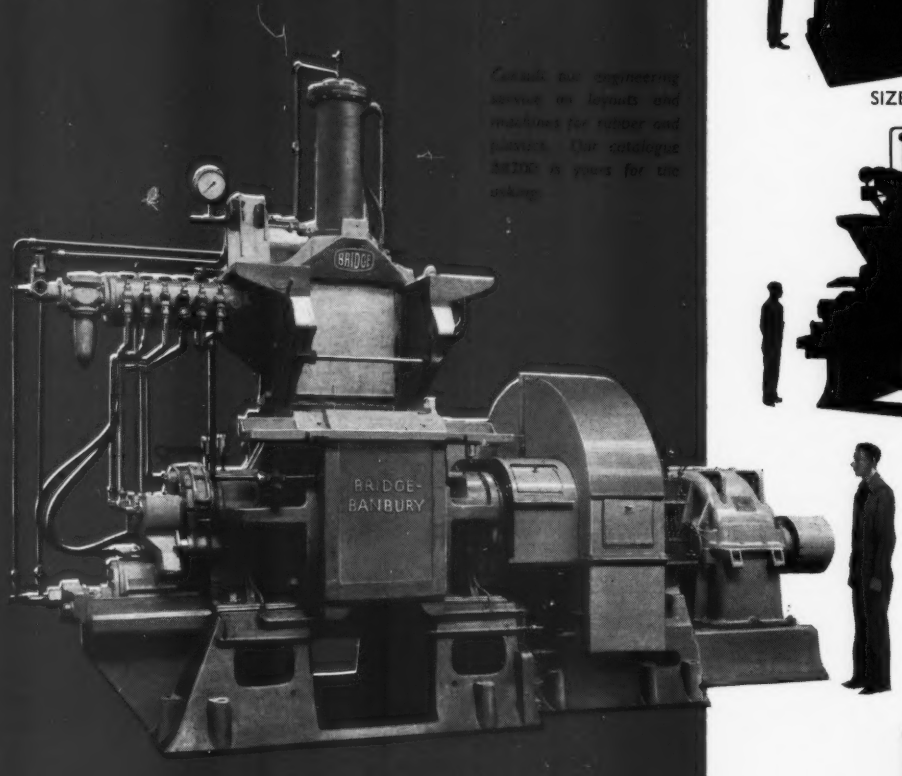
Produce the

Highest Output more quickly, more efficiently, and guarantee a more uniform and

Highest Quality mix. By minimising manual operating they produce at

Lowest Costs with the maximum degree of dependability and safety.

Consult our engineering service on layouts and machines for rubber and plastics. Our catalogue 3620C is yours for the asking.



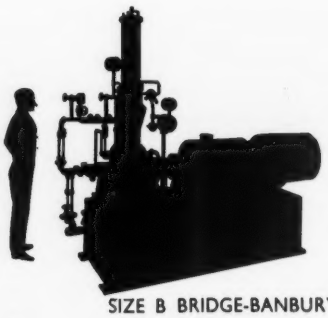
SIZE 11 BRIDGE-BANBURY

In technical association with Farrel-Birmingham Co. Inc. U.S.A.

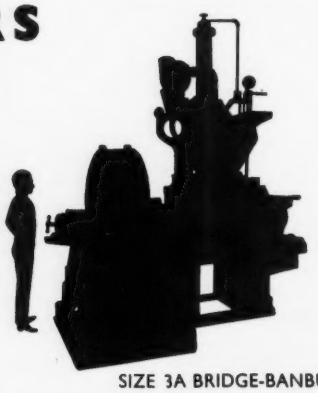
BRIDGE-BANBURY *Automation*

DAVID BRIDGE & COMPANY LIMITED

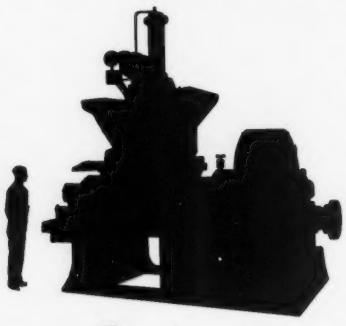
Castleton, Rochdale, Lancs. Phone: Castleton (Rochdale) 57316. Grams: Casting Phone Castleton Lancs.
London Office: Bridgeman House, 6, 7, 8 Sackville Street, Piccadilly, London, W.1. Telephone: Regent 7480.
Grams and Cables: "BRIDGACIDE" Piccy London



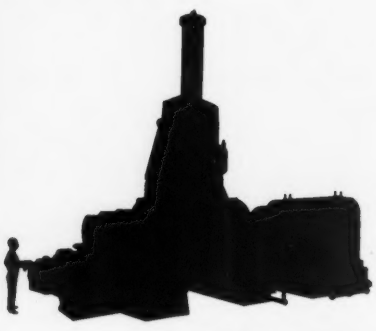
SIZE B BRIDGE-BANBURY



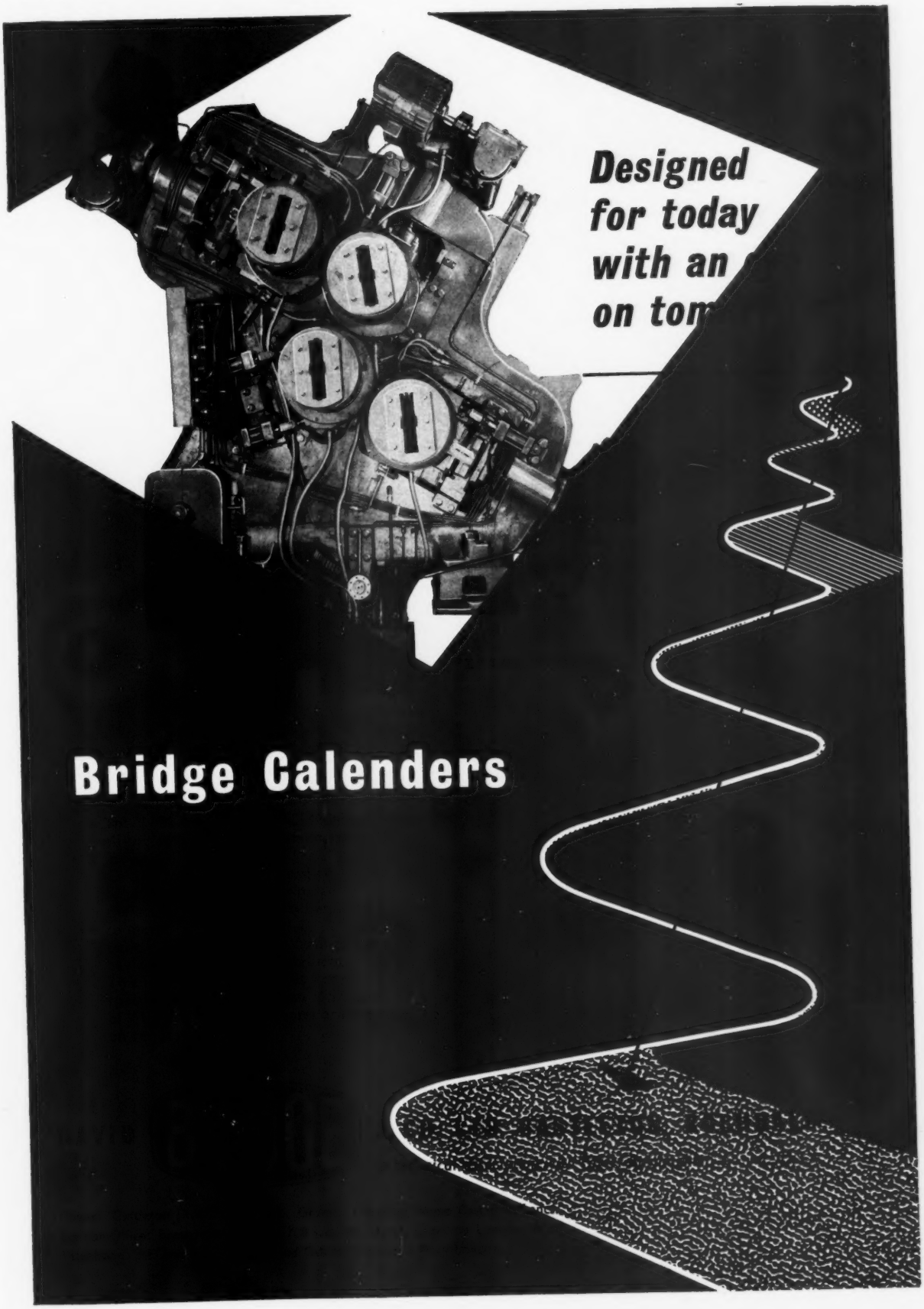
SIZE 3A BRIDGE-BANBURY



SIZE 9 BRIDGE-BANBURY



SIZE 27 BRIDGE-BANBURY


Designed
for today
with an
on tom
Bridge Calenders

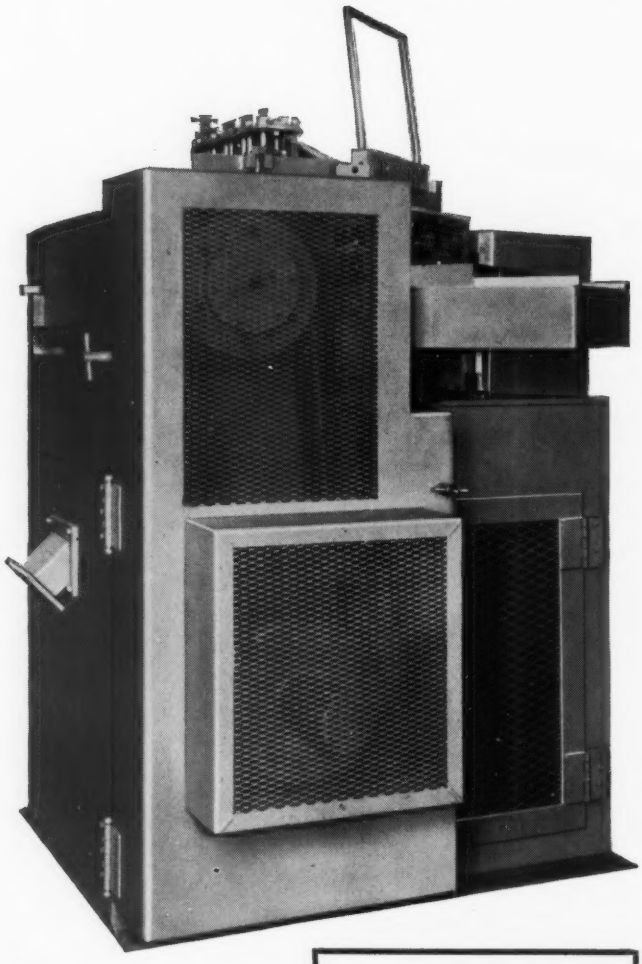
PERFECT CUBES

NO LONGS

NO DUST

Cut from sheet stock in one shearing action

THE BURTONWOOD CUMBERLAND "STAIR-STEP" DICING MACHINE



Burtonwood-Cumberland "Stair-Step" Dicing Machine offers you a completely new method of dicing plastic materials. Perfect cubes, free from longs, are cut from sheet stock in one shearing action! All sides of the cube are cut cleanly. Cubes or rectangular pellets may be produced in various sizes ($\frac{1}{16}$ in. to $\frac{1}{2}$ in.) by simply changing knives.

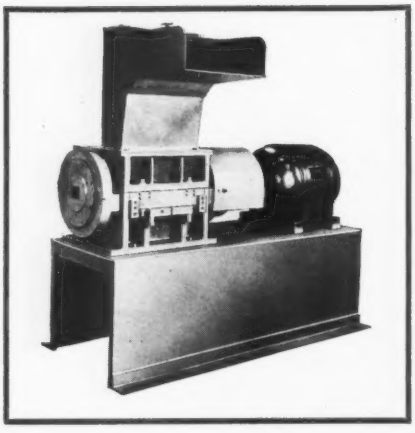
This new dicing principle makes it possible to dice the full range of plastic materials, including polyethylene, vinyl, acetate and nylon. Two standard machine sizes accommodate sheets up to 7 ins. or 14 ins. wide. Machines to handle greater widths can be specially built. Write for complete technical details.

FOLLOW THE LEADERS

This Equipment is used by leading cable and plastic manufacturers throughout the world.

GRANULATING MACHINES

New additions to the existing range of equipment

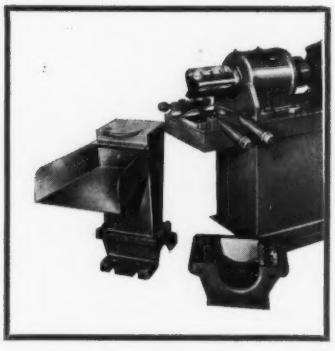


MODEL 20

High capacity all steel granulator, ruggedly built, suitable for reclaiming extruder and injection mouldings. Machine waste in large pieces.

MODEL $\frac{1}{2}$

High capacity small machine, suitable for placing adjacent to individual injection mouldings machines, for sprues and rejects.



Manufactured under licence from Cumberland Engineering Company, Inc., United States

BURTONWOOD ENGINEERING COMPANY LTD

Head Office & Works: BURTONWOOD, WARRINGTON, LANCASHIRE. Phone: Newton-le-Willows 3311 (10 lines)
London Office & Works: EDGWARE ROAD, THE HYDE, LONDON, N.W.9. Phone: Colindale 4661 (7 lines)

Quart into a pint pot?

Of course not! But you can get a quart out of a pint pot if you fill it first with BEXTRENE-X. For these polystyrene granules can be expanded up to many times their original volume, to form mouldings which are light, non-toxic, and tough, as well as being unaffected by water.

So in both quantity and quality BEXTRENE-X can be relied on for the packing of all kinds of fragile articles: glassware, instruments, fluid containers—and pots (pint or quart!)

Bextrene-X

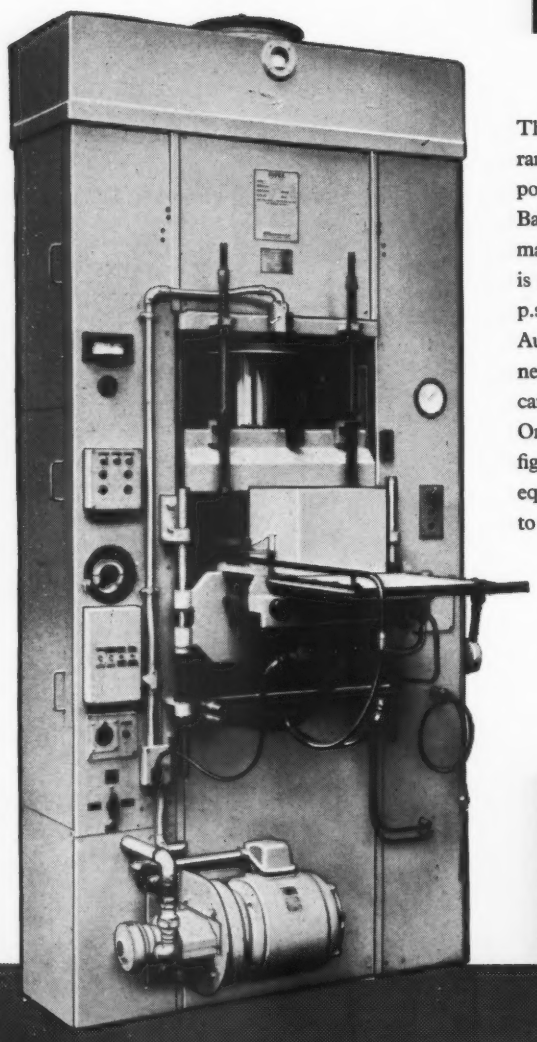
EXPANDABLE POLYSTYRENE GRANULES

BX PLASTICS LIMITED

(A subsidiary of The British Xylonite Co. Ltd.)

Higham Station Avenue, Chingford, London, E.4. Telephone: Larkswood 3311

BIPEL-the most productive P in the world...



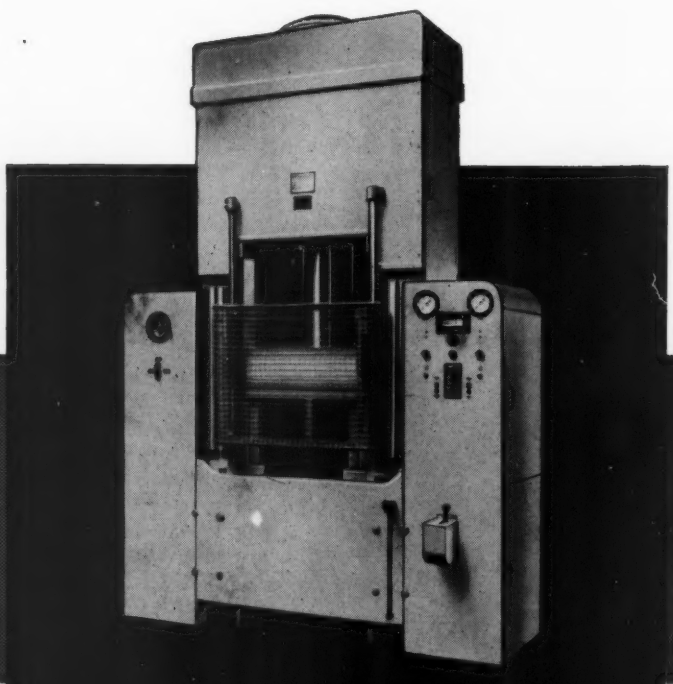
This is BIPEL—the modern system, designed for the times; a complete range of highly productive compression moulding presses, all incorporating auto cycle-control or fully automatic operation.

Basis of the BIPEL system is its economic, efficient principle, which makes it the *most useful* as well as the most productive of all; line pressure is fed at 1,000 p.s.i., which can be stepped up at will to 2,000 or 3,000 p.s.i. thus offering a choice of *three moulding pressures for each press.* Auto-control ensures a drastic reduction in rejects, by producing to a never-varying standard of quality. Moulding shop layout and condition can be revolutionized, for all line services are fed underground.

On every score, BIPEL adds up to increased production, reduced effort; figures of up to 20% increase are by no means unusual. If you are re-equipping, be sure to see BIPEL first—our engineers are always ready to help.

BIPEL 60-TON FULLY AUTOMATIC PRESS

BIPEL fully-automatic presses have been operating successfully for four years for British moulding concerns. This is an improved model incorporating numerous modifications with special reference to quick adaptability for short runs.



BIPEL TYPE 100 DOUBLE-ACTING SIDE RAM PRESS

This auto-control, line feed, double-acting side ram press gives main ram pressure of 150 tons maximum, with 18" stroke; side ram — 100 tons, 5" stroke each side.

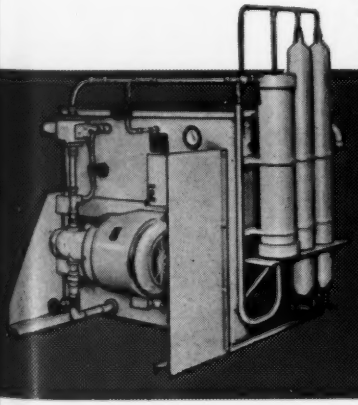
The Bipel System

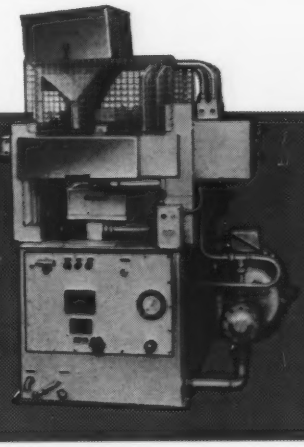
PRESS PLANT

TYPE 40		TYPE 100		TYPE 200		
English	Metric	English	Metric	English	Metric	
24"	610 mm	38½"	975 mm	47½"	1190 mm	Daylight Between Tables
14" x 14"	355 x 355 mm	20" x 20"	505 x 505 mm	30" x 30"	760 x 760 mm	Maximum Standard Heating, Platen Sizes
12.6 tons	12.8 tons	26.9 tons	27.3 tons	50 tons	50.8 tons	Transfer Ram Pressure

BIPEL RANGE OF AUTO-CONTROL PRESSES

The basic range of three auto-control presses for compression and transfer moulding, covering moulding pressures from 20-300 English tons. These presses can be individually supplied with compact, built-in hydraulic drive units; or line fed with hydraulic pressure at 1,000 p.s.i. from a centralised drive unit for multi-press installations.





of Auto-Control Hydraulic Moulding

B.I.P. ENGINEERING LIMITED Streetly Works • Sutton Coldfield • Phone: Streetly 78411

..new applications..new ideas..take selling shape in

'Cellastine' TRADE MARK

Acetate Sheeting

for Vacuum forming

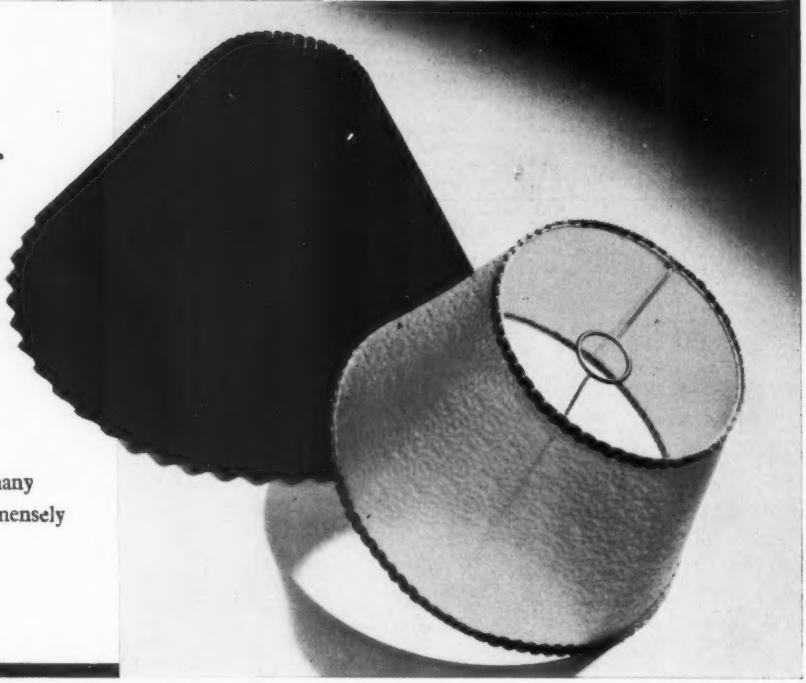
made by Boots Ltd.

This eye-catching brush and hand-cream display holder is typical of the sales-winning ability of vacuum formed 'Cellastine'. Note the effectiveness of colour and the beautifully finished appearance.

made by
E. & R. Jarvis Ltd.

Pleated or embossed

'Cellastine' throws new light on lampshade design with these strong, washable and colourful shades. They're proving so attractive and serviceable in so many homes — it's easy to see how immensely versatile 'Cellastine' can be !



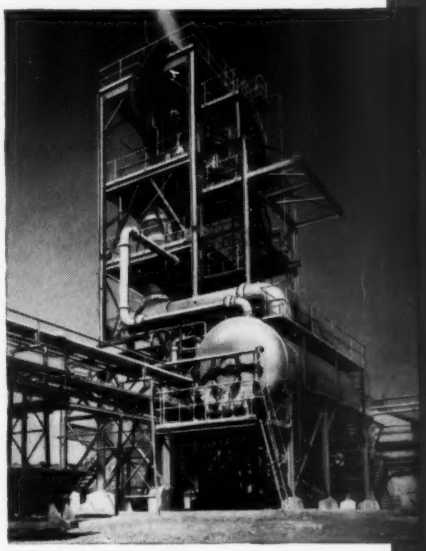
BRITISH CELANESE LIMITED

Plastics Division, Celanese House, Hanover Square, London, W.1.

Monsanto works constantly
both to develop new,
better chemicals
— and to improve those
chemicals you already use . . .

PHENOL
PARA CRESOL
*LUSTREX
MALEIC ANHYDRIDE
META CRESOL
PHTHALATE ESTERS
PHTHALIC ANHYDRIDE
*AROCLORS

We also welcome your enquiries for the following imported products which are manufactured by Monsanto Chemical Company, U.S.A.:
SANTICIZER* 141 — non-toxic, fire-resistant plasticizer for P.V.C.
SANTICIZERS AND SANTOLITES* — speciality plasticizers and resins.
*(*Registered Trade Marks)*



MONSANTO
Regd.

MONSANTO CHEMICALS LIMITED, 225 Mons[illegible]

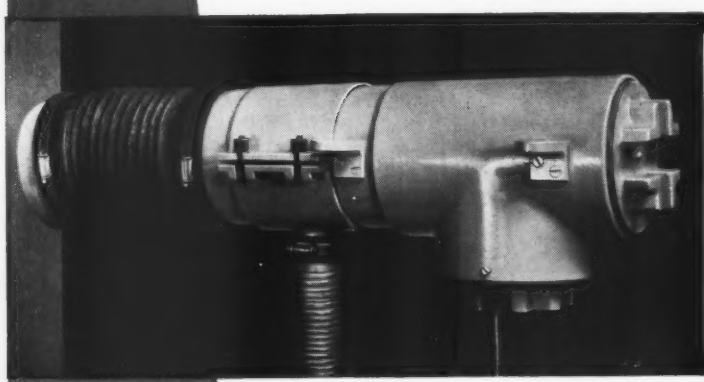
In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Limited, Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Ltd., Bombay. Representatives in the world's principal cities.

MONSANTO

Monsanto chemicals
help industry –
to bring a
better future closer

SILICONES AND SMOKE SIGNALS

I.C.I. Silicone Rubbers have a knack of solving many a tricky problem. To observe smoke density aboard certain H.M. warships, special photo-electric equipment, designed and manufactured by Radiovisor Parent Limited, has been installed. The viewing unit of the equipment is connected to the smoke ducting by a flexible hose of I.C.I. Silicone Rubber which isolates the instrument from any shipboard vibration. Another hose supplies purging air to the glasses of the projector and receiver to keep them free from soot deposits. The flexibility of I.C.I. Silicone Rubbers is maintained even at elevated temperatures, and this property combines with chemical resistance and excellent electrical characteristics to make these elastomers some of today's most interesting — and useful — materials.



I.C.I.

SILICONE RUBBERS

—material progress

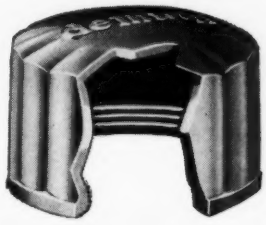
For fullest information get in touch with

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1.

ICI

NS 44

Cap—cut away to show Polythene seal which makes the case airtight.



Problem case solved!

AMONG THE HOST of items which a woman keeps in her handbag, you will usually find solidified cologne or lavender. Look at the case and you will probably find the name DEMUTH, whose FROZOCLONE and FROZOLAVENDER were the first in the world, and are still the only products with added soothing, cooling, and comforting properties —ideal for the relief of headaches and the tensions of everyday life. Naturally, the unique merit of these products demanded a high class container.

Some time ago, R. Demuth Ltd. discussed with Fraser and Glass the possibility of streamlining and making their existing container more attractive.

One of the chief problems was how to produce a vapour-tight case and so avoid deterioration of the product during storage. Previously, a rubber ring had been used for this purpose. Fraser and Glass not only designed a new and more attractive case, but also evolved a special Polythene seal which was permanently held in position in the cap. This provided a positive airtight seal.

All that remained was the problem of mass production. Three special automatic moulds were designed to produce the base, screw-on lid, and seal, in such a way that no subsequent finishing was required. A special automatic unscrewing mould was devised for the cap, effecting a considerable saving in normal production costs.

The finished container in green or lavender Polystyrene is now being economically produced in large numbers every week, meeting completely, the specifications required. Just another example of the skill and service which Fraser and Glass can offer to industry.

If you have a moulding problem in your *industry— no doubt Fraser & Glass can supply the answer.*

Another problem solved by

FRASER & GLASS

the plastics people

FRASER & GLASS LTD.,
WOODSIDE LANE, LONDON, N.12
TELEPHONE: HILLSIDE 2224-5

filabond

POLYESTER RESINS

WERE USED BY ..... EAST LANCASHIRE PLASTICS LTD. IN THE FABRICATION OF THE ELP TRACTOR CAB

filabond

POLYESTER RESINS
ARE MANUFACTURED BY

BECK KOLLER & Co. (England) Ltd.

BECKACITE HOUSE · SPEKE · LIVERPOOL · 19
TELEPHONE HUNTS CROSS 1214
ASSOCIATE WORKS · REICHHOLD CHEMICALS INC. · DETROIT · U.S.A.

Samples and Details available from Sole Selling Agents:
JAMES BEADEL & CO LTD · HEAD OFFICE · BECKACITE HOUSE · SPEKE · LIVERPOOL 19 · London Office: 110 CANNON ST. · E.C.4.

KEMITYPE LTD

offers the new KALLE film VF 56

(LOW PRESSURE POLYETHYLENE (Ziegler))

VF 56 is now freely available in form of flat film up to 700 mm. standard width and in gauges from 0.03 up to 1.0 mm. (approximately 1 to 40 thousandths). Also available in a limited colour scheme and embossed.

TECHNICAL DATA:

Specific Gravity	0.95
Tear Strength: With the web	2.6 – 3.4 kg. mm.^{2}
Across the web ...	2.2 – 3 kg. mm.^{2}
Elongation at Break	1,000 – 1,200%
Elastic Elongation	85 – 100%
Water Absorption	Below 0.1%
Moisture-vapour Permeability	3 gms/m^2/24 hrs. at 90% rH, 30° C. (Tested on 0.040 mm. gauge film)
Melting Point	129/130° C.
Useful Temperature Range	—50° C. to 120° C.
Breakdown Voltage	110 kV x mm. (Measured on 0.060 mm. gauge film 50 Hz, 20° C. 50% relative humidity)
Dielectric Constant, 800 Hz	2.4
Power Factor, tgd at 800 Hz	2 x 10^{-4}
Specific Resistance	Approximately 10^{16} ohm. cm.
Surface Resistance	(Comparative figure) 13

We shall be pleased to submit more detailed information on VF 56 film and therefore invite you to add as detailed and specific information relating to the intended use of the film to your esteemed inquiries.

Technical Advisory Services and Showrooms: 8, Chase Road, PARK ROYAL, LONDON, N.W.10

Tel.: Elgar 7695/6

Polyethylene resins and compounds

Phenolic and Alkyd moulding materials

Copper clad laminates

Foundry resins

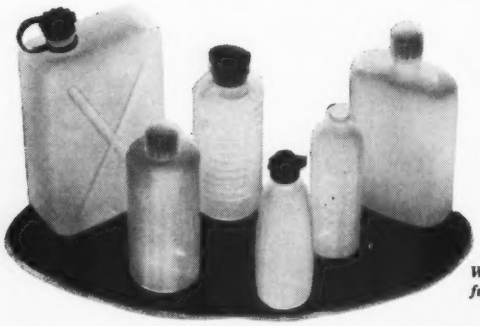
Epoxide resins

PLASTICS MADE BY

BAKELITE LIMITED

HAVE A PART IN EVERY INDUSTRY

In hundreds of industries, new applications are being found daily for the ever widening range of plastic materials manufactured by Bakelite Limited. In turn, Bakelite Limited are constantly developing new grades of plastics for specific requirements.



Bottles made by Lacrinoid Products Ltd., from BAKELITE Polyethylene. This versatile plastic has many applications in the Packaging industry.

Write or 'phone for further details now.

BAKELITE · WARERITE · VYBAK · SHALON

REGD. TRADE MARKS

BAKELITE LIMITED · 12-18 GROSVENOR GARDENS · LONDON SW1 · SLOane 0898

TGA GB13

Polyethylene moulding materials

Decorative laminated sheet

Surface coating resins

Cotton and glass fabric based laminates

P.V.C. extrusion and injection moulding compounds

P.V.C. calendered sheet

Laminated sheet, rod and tube

Polystyrene monofilaments

Polyester resins

Densified and Compregnated Wood

P.V.C. compounding and calendering Resins

Adhesives and cements

P.V.C. rigid and flexible pressed sheet

Plastics

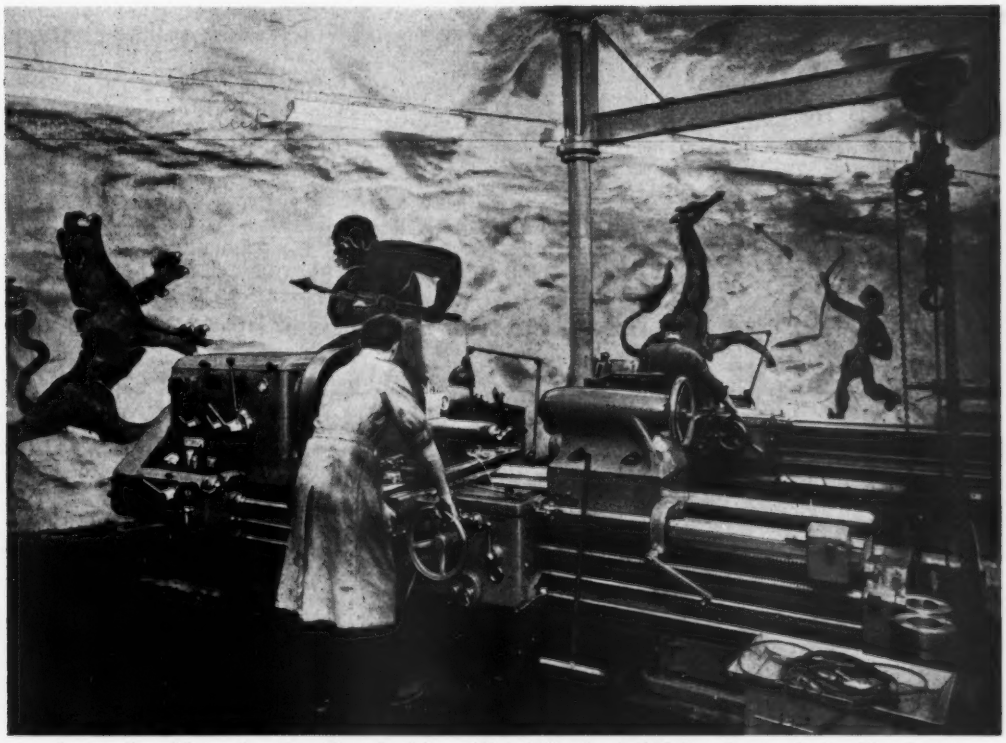
DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PROPRIETORS: TEMPLE PRESS LIMITED

CHAIRMAN and MANAGING DIRECTOR: ROLAND E. DANGERFIELD

CONTENTS

	Page
Editorials	289
Moulding Powder and Shot	290
EXHIBITION SUPPLEMENT	
Introduction	291
Mouldings Reviewed	292
Materials Reviewed	303
Machinery Reviewed	313
Convention Report	329
New Productions...	336
Plastics News	338
Automation Equipment	341
World's Industry Employs Plastics ...	342
Epoxy Plasticizers for P.V.C., by T. C. Moorshead	343
H.P.M. Injection Moulding Machine ...	346
Letters to the Editor	348
Patent Review	349



A new medium of factory decoration. The tool and die workshop of Skanska Attikfabriken, Perstorp, Sweden. Blasted out of solid rock, the walls are decorated with hunting "cave-men."

EDITOR: M. D. CURWEN, B.Sc., A.R.I.C.
ASSISTANT EDITOR: C. W. WELCH

Published on the second Wednesday of each month by the Proprietors, Temple Press Limited, and printed in England by Sir Joseph Causton & Sons, Ltd., London and Eastleigh

Annual Subscription Rate 36/–. Shorter periods pro rata

Editorial, Advertisement and Publishing Offices: Bowling Green Lane, London, E.C.1

Telephone: TERminus 3636

. . . tough indeed, for they have to lead a tough life, nosing into corners wherever dust is lurking, yet never bruising cherished furniture nor marking bright, new paint.

These protection strips, fitted to the nozzles of the Electrolux Z.62 Cleaner, are moulded by National Plastics to a very exacting specification, from p.v.c. flexible material. A tricky job, for the flexibility has to be controlled — so far and no farther.

National Plastics are specialists in the true sense of the word, and their advice, based on many years accumulated experience of industrial problems, is readily available to manufacturers in need of plastics components, large or small.

NATIONAL PLASTICS

NATIONAL PLASTICS (SALES) LTD · AVENUE WORKS · WALTHAMSTOW AVENUE · LONDON E.4 · *LARkswood 2323*

Plastics

VOL. XXII No. 239 AUGUST, 1957

EDITORIALS

Exhibition

THE British Plastics Exhibition of 1957 has clearly been the most successful—and the largest—ever held in Great Britain.

The greatest credit is due to the exhibitors themselves for never before have they responded so well to the importance of the occasion by building larger and individually better designed stands or showed their products, raw materials, new machines and new mouldings and fabrications to better effect. The change in the attitude of moulders and fabricators was especially noteworthy, for a few years ago the stands were too closely packed with units and components and one could scarcely see the wood for the trees.

We congratulate too the overseas exhibitors, German, French, Italian, Swiss and Belgian—most of them machine makers—among whose products we saw many brilliantly designed injection presses and extruders. No American machines were on view other than those made here by British agents while foreign raw materials were few. As this was an international exhibition it was a pity that the biggest American and German raw material manufacturers had decided not to take space.

Congratulations also to the staff of *British Plastics* which had organized the Convention with such splendid results and who carried out a heavy and onerous job with efficient and business-like methods.

International

A GOOD measure of the success of the Exhibition is the notable increase in stand-holders, some 270 in all—140% higher than the 1955 show which is primarily an indication of the increasing stature of the plastics industry itself on the one hand and the realization by foreign countries of the value of Great Britain as a market, on the other hand. An increase in attendance by visitors to about 90,000 including some 6,000 visitors from abroad was an additional mark of success, and the British public fulfilled the hope of all of us.

This International Exhibition and the admission of the public has obviously " paid off." Since quite a contingent came from the U.S.S.R. it may well be that we shall in 1959 see stand-holders from behind the Iron Curtain, which by then, we hope, will be transformed into a Nylon or Terylene Curtain, that both sides can pass through with susurrating ease and indeed with pleasure.

It has been an exhibition unlike any other. The B.I.F. like Scrooge—is dead—dead as a doornail, and because of it, gone too is the feeling that the plastics industry plays but a minor part in the industrial scene. We work in a field of major stature and from the first day of the show we sensed a new feeling—of excitement and confidence. And as the days passed, we had the surety that, for most, success was a financial one. Never before have we received such widespread reports that valuable contacts had been made and that much actual buying had taken place. What a change from the old British Industry Fairs when the plastics industry was glumly of one voice in regarding them merely as convenient yearly gatherings to meet customers.

Medals: Gold and Silver

WHAT were the most striking things we noted ? First, as we have already said the new spirit that reigned almost everywhere, that we were at last proving to everybody that plastics were materials of construction in their own right and that we knew at last where we were going.

Without doubt the test of this must be in the improved sales which indeed have resulted, but what does this in effect mean ? Surely it is that raw materials have improved and have expanded in number, that the intense effort expended in understanding the properties of these raw materials and the role of new machines must play in their moulding extrusion and forming, is having its effect. This much appeared in many of the conference papers and we can expect soon the new theories regarding the behaviour of these non-Newtonian fluids to have their effect on the future shape of extrusion, injection and vacuum forming machines. We are, for example, closer to understanding the values of injection mouldings as compared with similar shapes machined from extrusions.

From the heterogeneous mass of products on view what stood out most, to our mind ? No sooner do we think of one thing, than another pushes its way forward. So here are a few deserving medals and their metals are of whatever you think—we all have our own interpretation.

First, for us, a material for which we have so anxiously awaited its coming—the glass fibre/polyester premix announced by two companies, B.I.P. Chemicals Ltd. and Artrite Resins Ltd., for at last it takes away from the moulding shop a job it should not perform and enhances still further the possibilities of the matched-moulding process. With a substantial pot-life under controlled storage conditions and consistent properties this new material should advance even more rapidly. If only the wet-lay-up system could be so improved we should be much happier over this section than we have been. Perhaps the latest spraying machines for glass and resin will permit such improvements.

And next ? Perhaps the Swedish Perstorp company's lovely black phenolic mouldings with hand-carved silver inlays at last uniting brilliantly designed plastics with the best of the silver-smith's art. Or should it be Ekco's miracle watering-can, for production staff, designer and management had sat down together, considered the desired properties and functions of every component in the ideal unit to say nothing of the requirements of the user, and then produced a revolution—completely unlike the conventional form—but supremely efficient and functional. This example of what can only be called " design research " at its best, will, we hope be followed by others in the industry. It would be strange if this watering-can did not oust entirely the metal type.

They crowd on ! The Windsor sheet polystyrene extruder and take-off plant, the Bipel horizontal pelleting machine, the full-sized Perspex bath on the Thermo-Plastic's stand, the huge welded p.v.c. acid recovery plants shown by Bakelite Ltd. and by B.X. Plastics Ltd., the welded p.t.f.e. bag on the Siemens Ediswan stand and the clear success and wider acceptance of toughened (i.e. rubber-modified) polystyrene which made us ponder on the future of the general purpose material.

For most technical workers in the injection moulding field intense interest lay in the future of the machine. A concrete example of what can be done was shown in the high performance of a small Ankerwerk injection machine fitted with a screw, while the large number of excellent papers dealing with the future trend of injection and extrusion plant pointed to the need

for high-speed units, pre-plasticization injection moulding and for new and more closely controlled methods of heating moving masses. We can nearly see the new things to come, the new economies and physical improvements.

Medal: Putty

HAVING awarded our valuable prizes to almost every stand in the Exhibition let us say what we think it lacked—and this we saw only when, towards the end, we stood away from it all. Then, to us, the Exhibition appeared an amorphous shapeless mass, a huge medley of shops that told no comprehensive story to the outside world. What were we doing ? What relation did it all have to normal life and industry ? How did it all happen ? Here was a wonderful story, of chemical, physical and philosophic reasoning, a conscious effort to ease some of the burdens of this high-speed, nerve-racking, dirty world to evolve a cleaner healthier and more colourful existence " where neither moth nor rust doth corrupt," and nobody told it.

Or are these words too high-flown or merely a bad joke ? And if it is claimed that immediate sales over the counter are the only criterion for success, we reply that a far vaster and more rapid financial success lies in teaching the visitor and especially the general public what we are driving at. The crowd of school boys that were taken round by members of the Plastics Institute would have learned little, if it had not been for the explanations given by the enthusiastic members who served as guides.

There was no such story which could have added a touch of grandeur to the great effort that had been individually made, and we think it was a great chance lost. The only glimmer of that sort of feeling lay in the sculpture before the I.C.I. stand. Modern art at least, asks you to think for yourself. To us it told, simply and clearly, of man's power to create form, purity and even strength out of the earth, out of the inanimate, the formless, the weak, by his intelligence and control of physical forces, and thus it became a thing of beauty. It was, for us, the growth of the plastics industry. It should have stood in the central aisle for all to see from the entrance instead of the not very inspiring railway newspaper kiosk that obscured the view on entry. Well, 1959 perhaps ? We have gone beyond the Puddleton and Nijni-Novgorod Fairs !

The most noteworthy enormity committed concerns the gallery, which in our opinion should be demolished or closed. What should have been one of the most interesting and important expositions was the International Design Display which contained specimens of mouldings and fabrications from half-a-dozen countries; it was not only too small, but tucked away in the darkest and least frequented corner of the gallery, with the result that the few visitors who accidentally found their way to it, dismissed it as valueless. Presumably the space had been provided free, but it is scarcely in the British tradition to invite guests to one's house and then to feed them in the kitchen or attic.

Perhaps this and the central theme we have spoken of, should have been the job of the British Plastics Federation, which lamentably was not so much in the picture as we should have hoped. It would require the help of an unfettered body, and here we mean the Federation, to conceive and implement a " grand design," to provide a unifying theme. The impact on the lay and technical eye, given the exceptionally high standard of stand design seen at this exhibition, would be phenomenal.

Great Britain, through this Exhibition, can become the whole world's Mecca for the plastics industry and it can be made so if we enthuse its people with the spark of imagination and humanity.

MOULDING POWDER AND SHOT

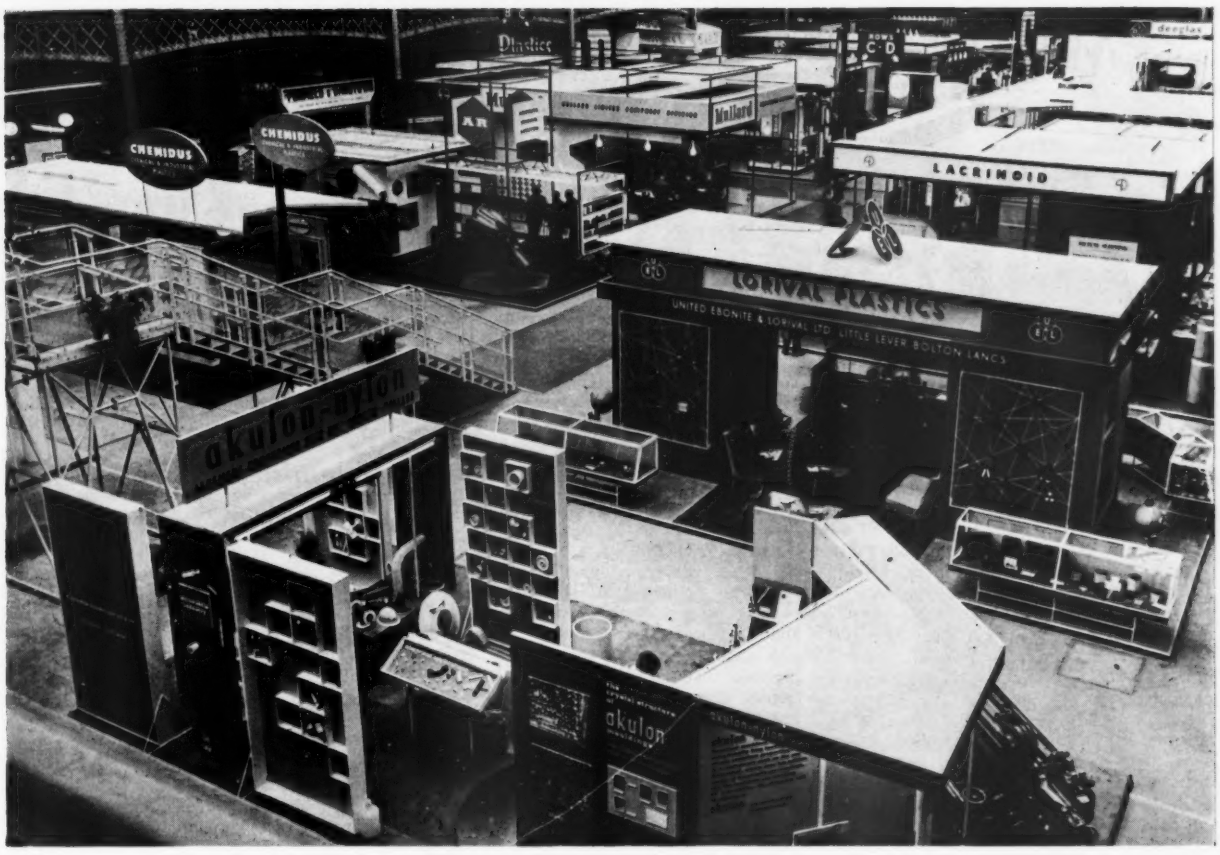
One for the p.v.c. boys

I've found a winner: something I've hoped to see for years, and of all places in foreign parts, on holiday. I've given up Old Ma Griggses place on the Marine Parade at Wapping Old Stairs because she wouldn't let a friend of mine in without luggage! Getting high and mighty because the next Conservative conference will take place there—so she says. This summer I went to Calvi in Corsica and stayed at Mme. Fifrelet's Hotel des Princes et Beausoleil (*prix speciaux pour commis-voyageurs*), just across the road from the gas-works and with a *vue sur le garage municipal.* What delighted me was that the dining-room looked beautifully clean and white for she had given up putting old copies of *Nice Matin* or *Courrier de Corse* on the tables and had invested in what I thought were real damask linen tablecloths samite white. As a matter of fact they really were, but coated on one side only with a p.v.c. or other surface transparent enough to see the damask design. She beamed when she saw me looking at them. With her vast bosom covered with dangling bugles, quivering with emotion she said, "Mistaire Doguesboddee, it is formidable. They save me much money. No bills of the laundry execrable; just a pass with a rag wet and clean." (The French talk like that.) Well to cut a very long story short, I came back to the British Plastics Exhibition and found what must be the same thing in the small hidden French stand up in the Gallery among the International Design Display. At least I suppose it's the same. Manufacturer: Société Linjvyl, 62 Rue Turbigo, Paris, IIIe. And I hear that somebody in Manchester is making or about to make something like it. It's a winner, as I say, and the restaurants of the world and the public are crying out for it.

DOGSBODDY.

Mr. Roland E. Dangerfield, chairman and managing director of Temple Press Ltd., presents the *Plastics* Goblets to Mr. T. S. Crabtree and Mr. F. E. Oldham at Sunningdale Golf Club, following the July meeting of the P.I.G.S.

Fifty years with B.I.P. At a celebration dinner at the Cafe Royal, London, Mr. J. Beard presents a gold watch to Mr. C. H. Glassey. Sir Laurence Merriam applauds. Beaming on the right is Mr. J. Erik Jansen of the Swedish Plastics Federation.



THE BRITISH PLASTICS EXHIBITION

A special supplement reporting the most successful exhibition and convention yet held in Britain

ON June 20 the Fourth British Plastics Exhibition closed its doors. Some 90,000 people had passed through the turnstiles, over 6,000 of them from overseas.

When compared with attendance figures for the 1955 exhibition, these totals underline the vast upsurge of interest in plastics in general, and the exhibition in particular, in two short years. In 1955, a total of 41,000 people attended, some 2,000 of them overseas visitors. More visitors, more exhibitors, signs of the rapid increase in the production of plastics materials, and the interest in these materials by industry and the world at large.

In this report we have tried to capture the dynamic spirit that characterized this, the first international plastics exhibition to be held in Britain. The following pages were compiled largely whilst the exhibition was in progress and by adopting a new method of coverage we hope that the reader of *Plastics* will find here an interesting and valuable analysis of the exhibits and the convention.

In place of the stand-by-stand descriptions usually employed in reporting exhibitions, we have sectionalized the moulding and fabricating, materials, and machinery groups with the object of segregating special fields of interest and also to permit a critical appraisal to be made within each section.

Thus the moulding and fabricating section has been reported by materials, phenolics, ureas, polystyrene, etc., indicating developments in the usage of these materials in the fabricated form.

Materials are reported by methods of use, compression powders, extrusion compounds, emulsions, etc. Here the object has been to study the pattern of consumption and developments in properties, applications, and new materials.

The machinery report has been grouped by machine types, compression presses, extruders, vacuum forming machines, welding plant, etc. Here special emphasis has been given to new machinery, or new modifications to plant previously shown. Many of the machines shown this year have been the subject of " Machines for the Industry " articles in recent issues of *Plastics*, and references to these are given.

A comprehensive report on the convention papers and discussions has been compiled, and will be found of special value in evaluating trends in various spheres such as material developments, new methods of fabricating, and other items.

Finally, the full-pages of stand photographs preserve permanently a visual record of this record-breaking exhibition, organized with great success by our contemporary, *British Plastics*. It has not been possible to reproduce a list of company addresses, but in the July issue of *Plastics*, pages 230–232, a complete record will be found of company names and addresses, to which reference should be made.

Mouldings seen at the Exhibition

The review of mouldings and fabrications seen at the Exhibition has been divided into separate sections under material headings. As wide a selection of mouldings and fabrications as possible have been reported and applications of the majority of plastics materials are given. This constitutes, as far as limited space will allow us, an accurate cross section of the progress made in the moulding and fabricating section of the plastics industry.

Phenolics

GOLF putters, weighted with lead, and computer parts were displayed as examples of the precision phenolic mouldings made by **Kent Mouldings Ltd.**

Components displayed by **Insulating Components & Materials Ltd.** illustrated their interest in machining and fabricating industrial laminates, injection, compression and transfer moulding. Demonstrations were given of the machining of screws from Tufnol rod.

Using their own moulding powder, **Birkbys Ltd.** showed a selection of mouldings in phenolic materials for gas meters. The material used had been specially developed for this particular application. Other phenolic mouldings included switch gear and electrical components.

Laminates having paper and fabric bases and copper clad laminates for printed circuits and insulating materials formed part of the display of **Ioco Ltd.**

The incorporation of a silver filigree cut-out in a black phenolic moulding was shown by **Perstorp Products (Great Britain) Ltd.** These mouldings, known as Silver Isolite, were well worthy of the position they held in the Design Stand.

The use of phenolic resins in conjunction with paper pulp to produce light but comparatively strong mouldings for the radio and television manufacturers, were shown by the **Patent Pulp Manufacturing Co., Ltd.** Other uses shown for these mouldings were storage and transporting trays.

Amongst a very large selection of phenolic mouldings shown by **National Plastics (Sales) Ltd.**, two were of particular interest if only in reference to their size. These were moulded filter tray and three-phase fuse box of large dimensions. Other mouldings shown by this company included meter cases and electrical switch gear.

Examples of the use of decorated plastic veneers in the construction of railway coaches was illustrated by **Insulation Equipments Ltd.**, who exhibited two full size sections of railway coaches together with fabricated components for the electrical engineering and aircraft industries. The coaches on view were a typical restaurant car and a colourful cocktail bar. Laminated materials formed the doors, cross-partitioning and interior of these coaches, the ceilings were of embossed Cobex p.v.c. sheet bonded to hardboard.

Ebonestos Industries Ltd. who produce over 10,000 phenolic mouldings displayed numerous examples of their precision work including compass covers, cooling tower spray nozzles and optical mouldings.

A cash register drawer in high impact phenolic material designed for use in the tropics, where wood drawers are unsuitable, was displayed by **Ekco Plastics Ltd.** together with other phenolic mouldings for the electrical, radio and T.V. industries.

Mica Products Ltd. showed their range of synthetic resin bonded paper tubes and cable ducts. This material is approved for use in aircraft and is used for making bobbins and spools for the textile industry.

The case and components for a pneumatic pressure switch moulded for Reavell & Co. Ltd., from Bakelite X 17181 rubber modified phenolic resin was featured by **Litholite Insulators and St. Albans Mouldings Ltd.** Components for contactor gear, accurate mouldings for micro switches, instrument cases, tag strips and other standard mouldings for the electrical and engineering industries made from a wide variety of phenolic moulding powders were displayed. Another interesting exhibit showing the number of materials used by this firm was a Thermos ice bowl. The actual bowl was moulded from phenolic material, with a polystyrene top and a polythene liner, the handles and feet were made from urea.

Cosmocord Ltd. displayed mouldings from phenolic material for domestic and electrical applications. Mouldings shown were made for Morphy Richards Ltd., De Havilland Aeroplane Co., Belling & Lee Ltd., and E.M.I.

J. W. Roberts Ltd. exhibited rods, tubes, gears and thrust bearings from their Ferobestos phenolic asbestos laminates. Other exhibits included Ferobestos bearings for Hunter nose wheels and chemical tanks.

Washing machine agitators moulded in phenolic material to several different designs were shown by **United Ebonite & Lorival Co. Ltd.**

London Moulders Ltd. showed the housing for the new Kenwood mixer, which has been especially designed for sale abroad, and has been completely restyled in design. The unit has been transfer moulded in black phenolic material employing a split tool. The tool itself is of extremely ingenious design and an excellent finish has been obtained. The cover for the unit is also injection moulded by London Moulders in polystyrene. The company also showed a wide range of products, including high impact polystyrene injection mouldings, phenolic compression mouldings and p.v.c. injection mouldings.

The phenolic housing for the Kenwood mixer moulded by London Moulders Ltd.

Melamine, Urea & Alkyds

READERS of *Plastics* will recall the page in the June issue of the journal devoted to the "Design of the Year" award won by R. Midwinter & Co., Ltd. The range of tableware in melamine moulding powder manufactured by **B.I.P. Chemicals Ltd.**, and moulded by **Streetly Manufacturing Co., Ltd.**, for Midwinter, formed the highlight of the Streetly display at the exhibition. A complete table was laid out in these very attractive mouldings.

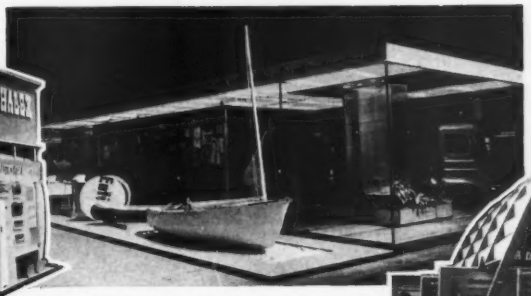
Flexo Plywood Industries Ltd. showed a building panel combining rigidity with light weight at low cost, and consisting of a Dufaylite honeycomb core surfaced on either side with a melamine treated laminate. Standard size panels of this material are 8 ft. × 4 ft., and standard thicknesses 1 in., 1½ in. and 2 in. The ⅛ in. hardboard faces, bonded to the core of Dufaylite, can be surfaced with a variety of attractive patterns and applications for this structural material include interior partitions, doors, counter tops, false ceilings, caravan bodies, cupboards, display stands and film and theatre sets.

New Formica patterns and colours (in 30 in. wide sheets) were introduced by **Thomas De La Rue & Co., Ltd.** New patterns including "star and dot" and "Torello" a pattern stimulating real marble available in various colours were displayed. A post forming grade of Formica for corners etc., and Delaron coloured laminated chair seats and backs and Delaron industrial laminates were also shown.

Excellent finishes were a feature of the **Ekco Plastics Ltd.** range of coloured toilet seats made from wood filled urea. Wireless

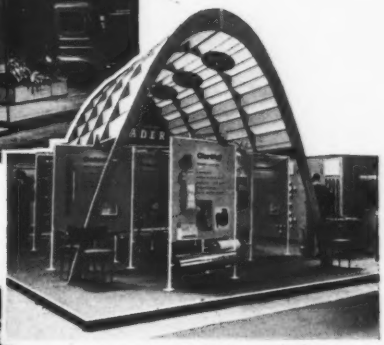
The use of Perstop decorative laminates shown in a typical Swedish kitchen.

(Above) Cascelloid.



(Left) Bakelite Ltd.

(Below) Birkbys Ltd.



(Above) British Celanese Ltd.

(Above) Airothene Ltd.

(Above) Chemidus Plastics Ltd.

(Above) Bristol Aircraft Ltd.

(Above) Commercial Plastics Ltd.

(Above) Cellgrave Co., Ltd.

(Below) Mange Plastics Ltd.

(Above) Ashdowns Ltd.

(Right) Cosmocord Ltd.

(Right) " Design of the year " melamine tableware moulded by Streetly Manufacturing Co. Ltd.

cabinets, and the new Ecko single hot-plate with a stainless steel lid were exhibited as other examples of urea mouldings.

The new Alba midget radio cabinet was displayed by **Crystalate Ltd.** as an example of their compression mouldings in urea. Hair drier cases and radio knobs were among other mouldings shown.

Brightly coloured tumbler holders made for Pyrex glasses and rolling pins etc., compression moulded from paper filled urea, were shown by **Insulators Ltd.**

An electrical contactor switch casing was one of the mouldings in alkyd materials shown by **G.E.C.** These materials are becoming more popular particularly in the electrical industry where their electrical properties are very good.

Polystyrene

A NEW refrigerator cabinet hood for Condesco Ltd., vacuum formed from high-impact polystyrene, was exhibited by **Cellgrave Co., Ltd.** Other examples of the company's work included 3D advertising plaques.

A Stantec self-contained telephone unit, made in high-impact polystyrene for Standard Telephones and Cables Ltd., was exhibited by **Kent Mouldings Ltd.**

Double shot moulded typewriter keys and mouldings for advertising and display in polystyrene illustrated the high quality of the work of **J. F. Kenure Ltd.**

A wide selection of polystyrene mouldings used for the refrigeration industry were shown by **Halex.** Other industrial mouldings included acrylic light fittings.

A very wide selection of vacuum formed industrial mouldings, using heavy gauge sheet to provide the rigidity and strength, were shown by **Omega Plastics Ltd.** P.v.c. and polystyrene sheet were the principal materials used, and besides the industrial mouldings a considerable number of packaging and display features were shown.

One of the first to be seen in this country, **Ashdowns Ltd.** were showing a vacuum formed radio cabinet in styrene high impact sheet material.

Insulators Ltd. exhibited a camera body injection moulded for Ross-Ensign Ltd., from HI polystyrene as an example of their precision work.

A new toilet roll holder with an ingenious stop device to prevent waste and a tissue holder were shown by **Ekco Plastics Ltd.** Injection mouldings of high impact polystyrene shown included a radio cabinet and a bread bin. The radio cabinets were stove enamelled in various colours or had finishes simulating leather. A beautiful Frigidaire refrigerator with pink fittings was displayed, the vacuum formed door incorporating the egg rack was from HI polystyrene sheet.

Injection mouldings from polystyrene were exhibited by **Mica Products Ltd.** Mouldings shown included novelties, toys, coathangers, clockcases and " Grippalite " electric handlamps made from HI polystyrene.

A.E.R. Ltd. showed a number of bottle caps etc. in polystyrene and cellulose acetate covered with metallized high vacuum depositions.

Thin wall containers formed from polystyrene sheet for the food and other industries and manufactured by the Kaberit process were a new development exhibited by **Rosedale Associated Manufacturers Ltd.** This process is of German origin and the exhibition was the first time its products had been shown in this country.

Besides the extensive range of mouldings in the majority of thermoplastic materials **Injection Moulders Ltd.** displayed some high quality injection moulded television escutcheons in high impact polystyrene.

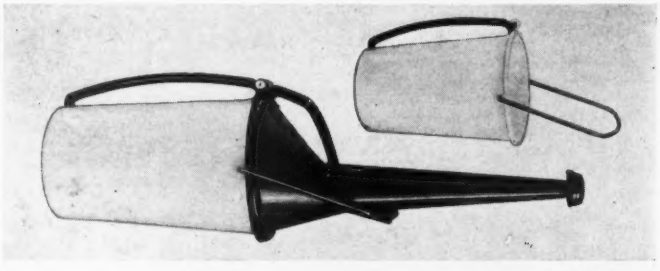
Polythene

PERHAPS the largest display of laboratory equipment was that of **Airothene Ltd.,** fabricators and injection moulders of polythene. The display included taps, beakers, graduated flasks, pipe couplings, trays, piping, large and small tanks and petri dishes. The larger materials shown were items fabricated from sheet p.v.c., the smaller items being injection moulded.

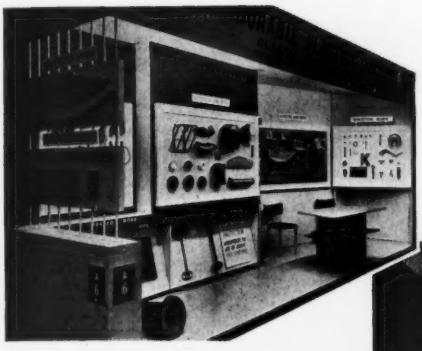
A completely new article in the Fethaware range of domestic items, moulded by **Fraser & Glass Ltd.,** was a polythene coke hod. Smart in design and light to lift, with a metal shute for added strength, this coke hod is non-rusting, non-chipping and will last a great deal longer than the conventional metal article. The overall height is approximately 20 in., and it is offered for sale in metallic shades of red, green and blue, as well as a mat black. A gardener's bucket and basket was also shown in the Fethaware range by Fraser & Glass, the 2-gallon bucket being moulded in an extra thick material and graduated inside in ½-gallons. The gardener's basket is light, roomy, and has strong metal handles. Small holes are drilled in the base for drainage, and both articles are made from dark green hard-wearing polythene.

An interesting example of skilful moulding in polythene was shown by **Pendry Plastics**

Telephone handset moulded in high impact polystyrene by Aldridge Plastics Ltd.

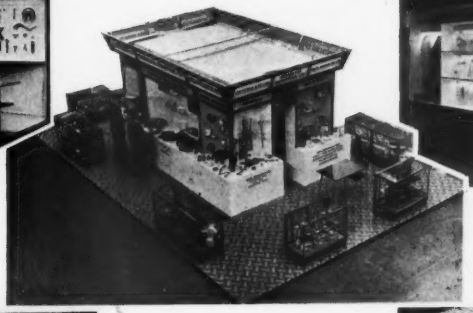


The new polythene and high impact polystyrene watering can designed and moulded by Ekco Plastics Ltd.

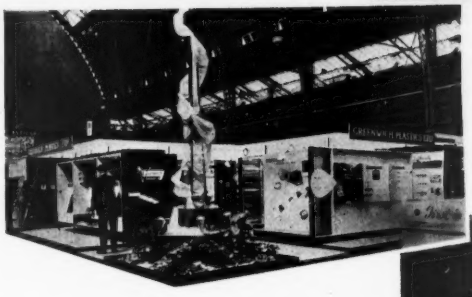


(Right) Crystalate Ltd.

(Left) Durable Plastics Ltd.



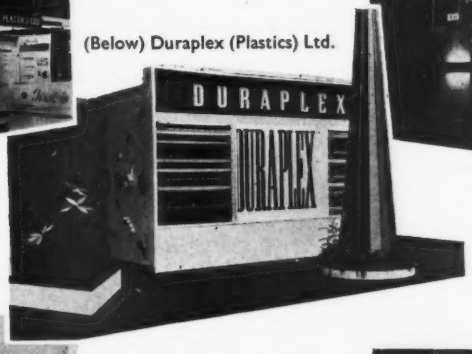
(Above) Fraser & Glass Ltd.



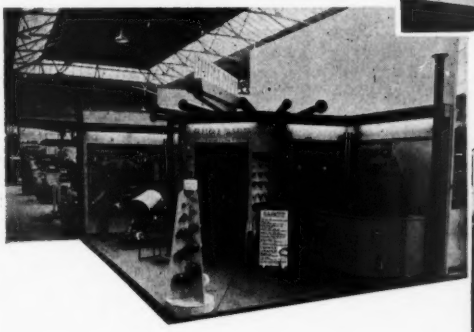
(Above) Greenwich Plastics Ltd.

(Below) Richard E. Dupont Ltd.

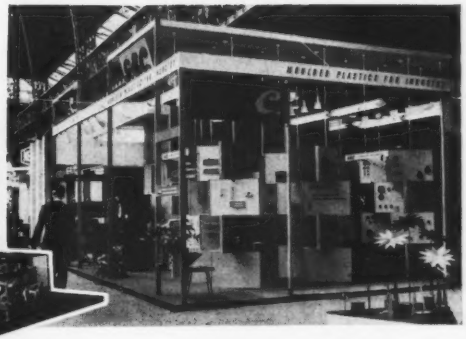
(Below) Duraplex (Plastics) Ltd.



(Above) Flexo Plywood Industries Ltd.



(Below) Leslie Gordon Ltd.



(Above) General Electric Co., Ltd.

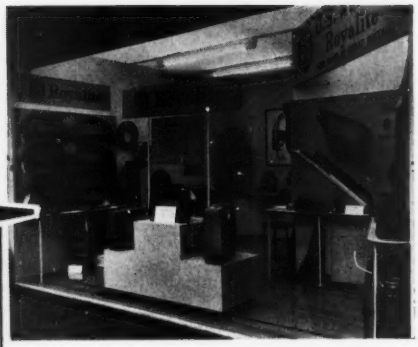
(Below) Ekco Plastics Ltd.

(Below) Thomas De La Rue & Co. Ltd.

(Above) Extrudex Ltd.

(Left) Streetly Manufacturing Co. Ltd.

(Right) North British Rubber Co. Ltd.



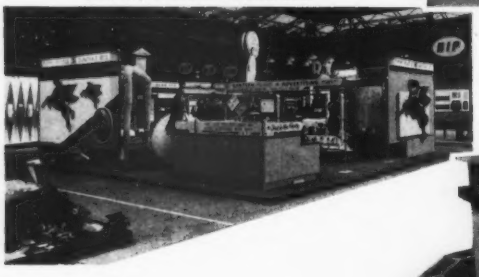
(Above) Wilmot Breeden Ltd.

(Below) Telegraph Construction & Maintenance Co. Ltd.

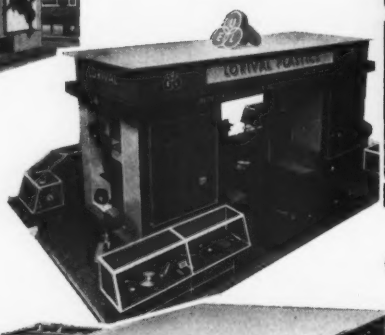
(Right) Tenaplas Ltd.

(Left) Suntex Safety Glass Industries Ltd.

(Below) Thermo-Plastics Ltd.

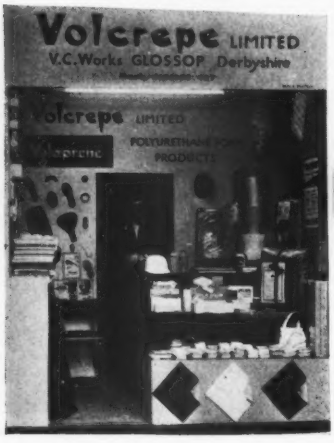


(Below) Yorkshire Copper Works Ltd.



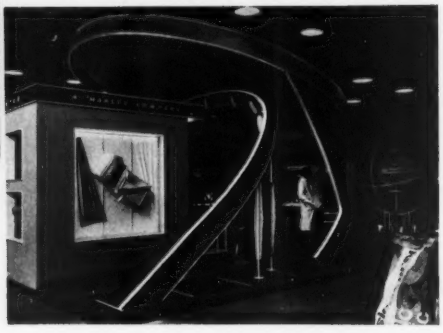
(Left) United Ebonite & Lorival Ltd.

(Below) Volcrepe Ltd.

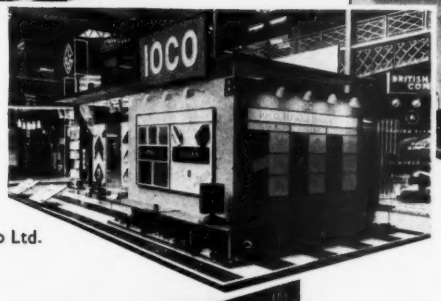


(Above) Tufnol Ltd.

(Below) Wallington Weston & Co. Ltd.



(Left) Kent Mouldings Ltd.
(Right) Kingston Mouldings Ltd.
(Below) Isobelec S.A.



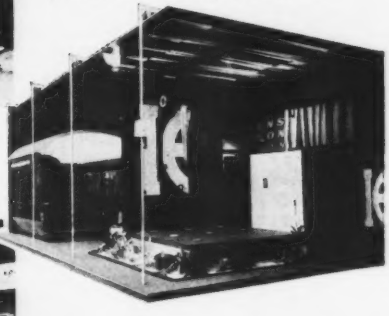
(Right) Ioco Ltd.

(Below) Gubin Plastics Ltd.

(Above) Injection Moulders Ltd.

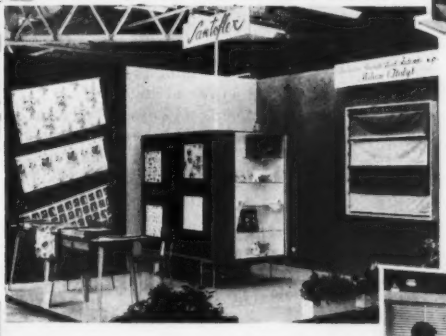
(Below) Insulators Ltd.

(Below) Insulation Equipments Ltd.

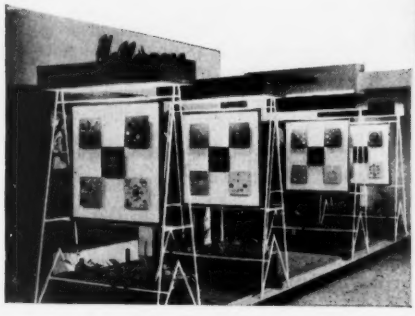


(Above) J. F. Kenure Ltd.

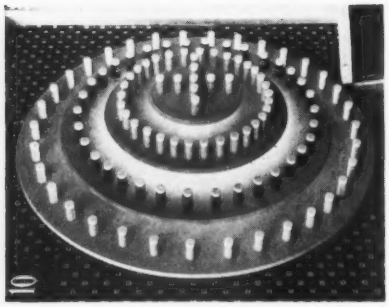
(Below) Industrie Riunite Sant' Antonio



(Below) Insulating Components & Materials Ltd.



(Left) Hellermann Ltd.



Polystyrene containers moulded by Prestware Ltd.

Ltd., where a face mask in which a free wire insert had been incorporated was displayed by the company.

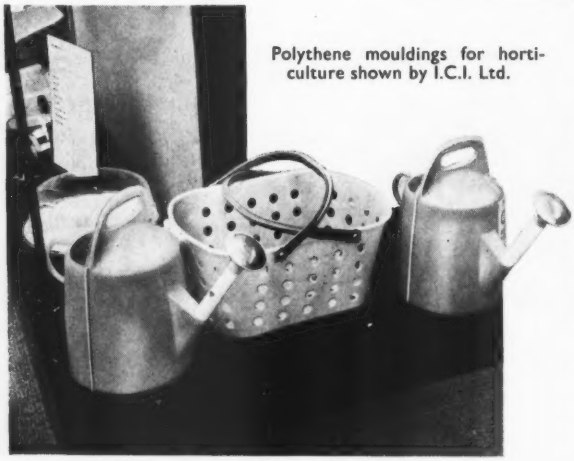
A display of polythene tubes and bottles on the stand of **Cascelloid** gave the visitor some idea of the advances which have recently taken place in the printing of these containers, their attractive design combined with this printing makes them very popular in the cosmetic and similar industries.

The replacement of copper by polyethylene piping was illustrated by **Yorkshire Copper Works Ltd.** A lay-out for household cold water services was shown using Polyorc A polythene tubes and Plastronga Ziegler polythene fittings. Illustrations of the laying of Polyorc A pipes by the method of mole ploughing were shown. Other exhibits included pipes for spraying and irrigation and p.v.c. beer hose.

Kingston Mouldings Ltd. displayed a wide range of blow moulded containers from polythene. Babies' feed bottles, fruit shaped containers for fruit juices and a milk container for the thermos flask were shown, together with sprays and powder dispensers.

Lacrinoid Products Ltd. exhibited numerous bottles of capacity from ¼ oz. to 12 gallons manufactured from polythene.

The Fablothene range of lay-flat tubing, sheet, film and bags, printed or unprinted, in thicknesses from 120 gauge to 500 gauge, were displayed by **Anglo-American Plastics Ltd.** Examples of the use of this material for the packaging of a wide range of products from knitwear to garden produce were shown. Fabrilon polyethylene tablecloths, traycloths, trolleycloths and doilies, were exhibited by **Fablon Ltd.** This company handles all **Commercial Plastics Ltd.** products, which are sold by the retail trade.



Polythene mouldings for horticulture shown by I.C.I. Ltd.

Tenaplas Ltd. were showing a complete range of extrusions in all materials suitable for this technique. One of the most interesting items was a fabricated polythene flushing ring supplied to Bristol Aircraft Ltd.

Many domestic mouldings were shown by **A. S. Gubin,** including moulded shopping baskets in polythene.

A unique two-in-one watering can and a "Superbath" baby bath both in polythene were featured by **Ekco Plastics Ltd.** The watering can can easily be converted into a deep graduated bucket, it is lightweight, comfortable to carry, easily filled and has a long reach. A measuring jug which can be sterilized made for B.O.A.C. for baby's feed in H.D. polythene was also shown.

Durable Plastics Ltd., who have recently opened a new factory at Guildford (see *Plastics*, June, 1957) showed their range of polyethylene coated work. Among industrial equipment, were coated tool handles, control levers and impellers. Polythene covered domestic wire work shown included articles from bath-racks to self-service baskets and milk crates. A heavily coated polio vaccine crate capable of withstanding sterilization and shockproof, created much interest together with a completely anti-corrosive conduit for chemical plant. The company can also undertake internal coating of pipework.

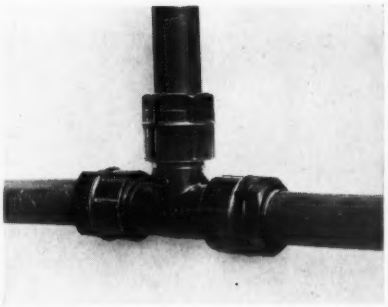
"Merad" irradiated polythene insulated equipment wire was featured by **Mersey Cable Works Ltd.** Interesting photographs illustrating the irradiation process by Van der Graaff generator were displayed.

The recently introduced Poly-Pika container made from Alkathene was featured by **Insulators Ltd.** It is available perforated or plain with handles or an adjustable shoulder strap and has a capacity of 24-28 lb. A Tote-Bin in polythene was also displayed.

An interesting exhibit on the stand of **Mange Plastics Ltd.,** was the Polytite fitting, designed for use in polythene water supplies. The fitting works on a simple mechanical principle whereby the comparatively soft polythene tube is compressed by means of a nylon backnut upon a rigid male member precision moulded high density polythene. These fittings will undoubtedly be of greatest assistance in the installation of polythene piping systems for a variety of purposes including cold water supplies and chemical plant.

A very full and attractive range of polythene bottles and containers was shown by **Lustroid Ltd.** The company also showed many other examples in the injection moulding field.

One of the displays which most caught the eye of the public was that of the **Metal Box Co., Ltd.** with the complete range of Polytainer packages both of the stock mould variety and the custom made units. These range from packaging media for cosmetics, to foodstuffs, insect eradicators, and disinfectants. The wide range of attractive designs and colours shown on the Metal Box stand demonstrated the strong hold that the polythene bottle now has on the packaging field, by



H.D. polythene pipe joint moulded and designed by Mange Plastics Ltd.

virtue of the sales appeal, strength, and other attractive features.

The uses of Diothene polythene film manufactured by the **Metal Box Co., Ltd.** was demonstrated on the company's stand by a range of packages including clothing, foodstuffs, and horticultural goods. This film material, now well established in the packaging field, has many attractive properties, including transparency, resistance to moisture vapour, toughness and flexibility, ease of heat sealing, and chemical inertness.

Among the wide selection of mouldings shown by **United Ebonite & Lorival Ltd.** were polythene cistern floats and other plumbing accessories.

Large polythene mouldings, many of them weighing several pounds served to introduce the Engal moulding process which **Rosedale**

Large polythene mouldings made by the Engal process by Rosedale Ass. Mfrs. Ltd.

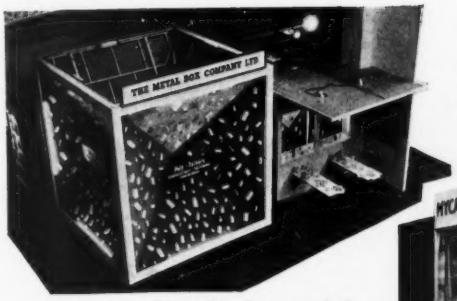
Associated Manufacturers Ltd. are now using. Transport bins, carboys and tanks and baths were a few examples of this process.

Cellulosics

A RANGE of scale models of cars for Victory Industries (Surrey) Ltd. moulded in cellulose acetate were shown by **Kent Mouldings Ltd.**

An injection moulding in cellulose acetate butyrate by **Birkbys Ltd.** was one of many examples from their injection moulding shop. The moulding in question was an inter-office telephone set.

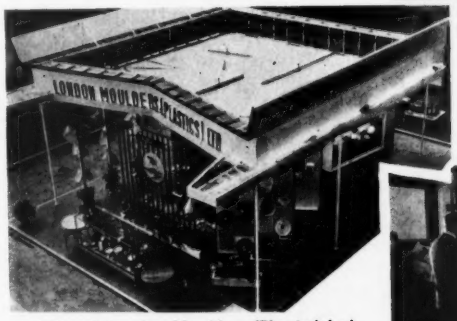
Injection moulded acetate fingernails, which are being exported to all countries, were shown by **Pendry Plastics Ltd.** These articles show a high degree of skill in moulding and finish.



(Above) The Metal Box Company Ltd.

(Below) Mycalex Corporation of America.

(Above) National Plastics (Sales) Ltd.

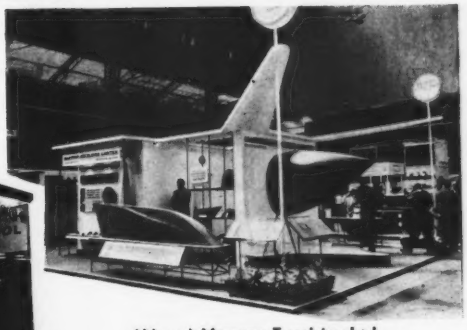


(Above) London Moulders (Plastics) Ltd.

(Above) Melwood Thermoplastics Ltd.

(Above) Lacrinoid Products Ltd.

(Above) Olympic Plastics Ltd.

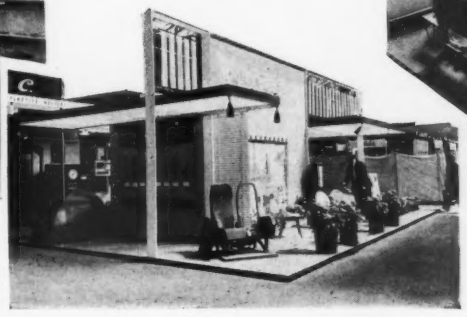


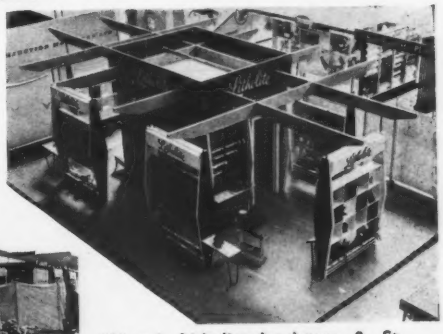
(Above) Marston Excelsior Ltd.

(Above) Omega Plastics Ltd.

(Below) Microcell Ltd.

(Above) C. & C. Marshall Ltd.





(Above) Litholite Insulators & St. Albans Mouldings Ltd.

4-D packaging, the fourth dimensions being product-visibility, was featured by **Thomas De La Rue & Co., Ltd.** Such containers are extruded from clear cellulose acetate and are designed to meet the needs of self-service stores, ironmongers, chemists and stationers. A range of tool handles machined from extruded cellulose acetate butyrate rod were also displayed.

Double shot mouldings for typewriter keys etc. in cellulose acetate butyrate were shown by **Ekco Plastics Ltd.**

Nylon & Polyurethane

AMONGST the many interesting mouldings shown by **G.E.C.** was a nylon fan which is used in connection with an electric motor.

One of the main features on the stand of **Melwood Thermoplastics Ltd.** was a complete range of nylon rod manufactured in diameters up to a maximum of 4 in. Extruded from the A.M.180 range of nylon manufactured by I.C.I., this solid rod material is designed to be employed for a wide variety of fabrications and is particularly suitable for turning prototypes for the manufacture of valves and seals and other items employed in industry.

Insulators Ltd. showed a wide selection of components, gears, bobbins, bushes and collars injection moulded from nylon.

Ioco Ltd. showed for the first time their Linapol polyurethane coated Terylene materials. Linapol is available in two grades, the heavier grade for industrial tarpaulins etc. and the lighter grade for raincoats and protective clothing.

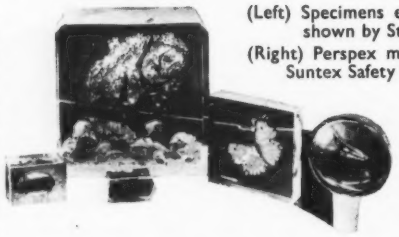
P.T.F.E.

ONE of the highlights of the exhibition was the display of p.t.f.e. fabrications shown by **Siemens Ediswan Ltd.** Of particular interest were p.t.f.e. bags manufactured from sheet material, and welded. At the moment these are laboratory products, and arrangements for commercial manufacture are not yet complete. They are however, the first bags of their type to be manufactured and shown in p.t.f.e. and they are also the first to be welded. They will find application in the lining of chemical tanks and for the carrying of aircraft fuel. Other interesting items in p.t.f.e. shown by Siemens Ediswan included meter probe covers, mouldings of some 2 ft. in depth, moulded beakers and roller covers for the bakery trade.

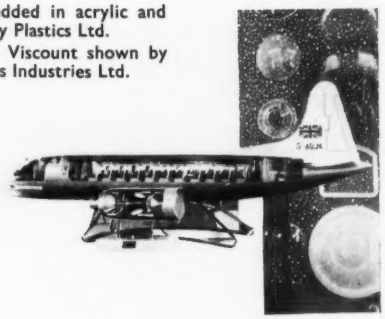
To facilitate easy removal of contents from confectioners' trays, **Durable Plastics Ltd.** offer a p.t.f.e. spraying service. P.t.f.e. spray coatings can also be used as a mould release and for other non-stick applications.

" Merflon " insulating equipment, wire tapes, and sleeving and p.t.f.e. cables were shown by **Mersey Cable Works Ltd.**

A small CF2 rod and tube extruder capable of producing material up to 3½ in. o.d. which was designed and built by **Crane Packing Ltd.,** formed a static exhibit on their stand. Samples of rod and tube from Fluon together with u-rings, valve caps, gaskets and expansion bellows were also shown. Crane Packing Ltd., have also developed a mechanical seal, and a bellows pump made from Fluon, Fluon-loaded or Fluon-sleeved components for use with highly corrosive chemicals. A " Fluo Seal " mechanical seal and a bellows pump were shown.



(Left) Specimens embedded in acrylic and shown by Stanley Plastics Ltd.
(Right) Perspex model Viscount shown by Suntex Safety Glass Industries Ltd.



Acrylics

A HIGHLIGHT on the stand of **Thermo-Plastics Ltd.** was the first full size Perspex bath to be made in this country, embodying a number of practical advantages. These baths are light in weight and easy to install, do not chip or rust, are unaffected by boiling water, are warm to the touch, are easily cleaned with warm soapy water and are available in permanent opal and pastel shades. The bath actually shown on the stand by Thermo-Plastics has undergone considerable use prior to being shown.

Wilmot Breeden Ltd., who were responsible for the exhibition lapel badges, exhibited a number of handles for refrigerators and cookers. A push-button handle moulded entirely in acrylic material with a vacuum plated three-dimensional motif and pull-out handles in chromium-plated zinc base alloy die castings with three-dimensional moulded acrylic inserts were displayed. Servolatch, an entirely new type of latch mechanism developed for refrigerator and cooker doors was also shown, together with a number of three-dimensional signs for display.

An attractive display by **Ashdowns Ltd.** was one of the cube lanterns used by the breweries for both internal and external decoration. The sample shown by Ashdowns Ltd., in Perspex, was a lantern for Charringtons.

Suntex Safety Glass Industries Ltd. have increased their range of seamless acrylic tubes which will find wide employment in industrial and domestic applications. The company was also exhibiting a complete range of light fittings, including troughs, diffuser lanterns and similar items, together with domestic units.

3-D signs for A.E.C. and radio panels, injection moulded from Diakon, were shown by **Punfield & Barstow (Mouldings) Ltd.** New Friedland door chimes and illuminated bell pushes in polystyrene were displayed together with a spectacle frame hearing-aid in acetate.

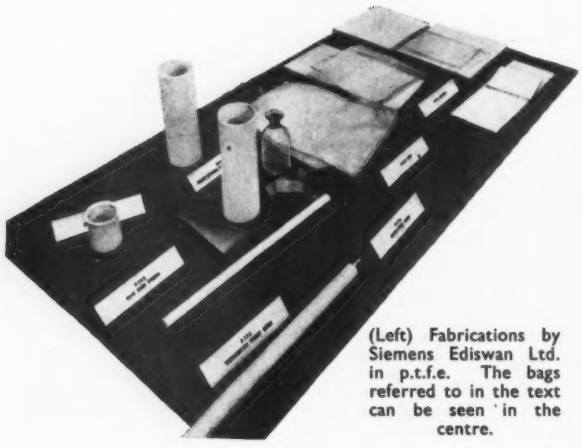
One of the most fascinating exhibits was that of **Stanley Plastics Ltd.,** showing the range of Transpalite glass-clear acrylic embodiments. These can be made in almost any size or shape up to 2 cu. ft. and practically any content can be embedded with the exception of pure copper painted or cellulose parts and wet objects. Stanley Plastics Ltd. also showed a range of acrylic castings in the form of seamless tubes, and also blocks, slabs and rods.

A feature of the **Olympic Plastics Ltd.** stand was the wide selection of formed acrylic signs, display fittings and advertising plaques.

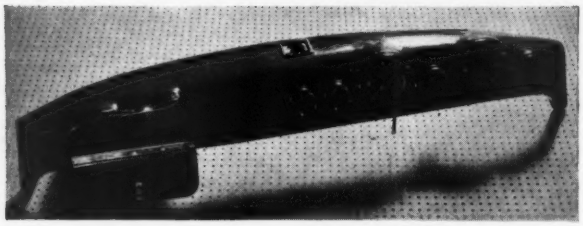
Attractive engraved door furniture and cabinet handles were displayed by **Lacrinoid Products Ltd.**

Polyesters and Epoxies

A SELECTION of specially prepared polyester glass fibre laminates for the aircraft industry was a feature of the **Bristol Aircraft Company's** stand.



(Left) Fabrications by Siemens Ediswan Ltd. in p.t.f.e. The bags referred to in the text can be seen in the centre.



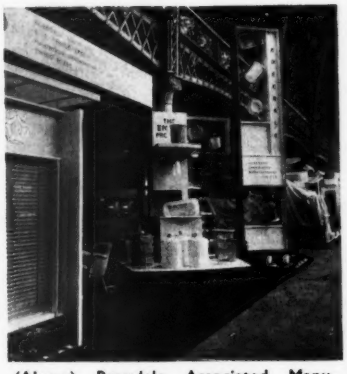
(Above) Fibreglass mat reinforced polyester resin Alvis instrument panel moulded by Willowbrook (Coachworks) Ltd.

(Above) Phoenix Rubber Co., Ltd.

(Right) Prestware Ltd.

(Above) Perstorp Products.

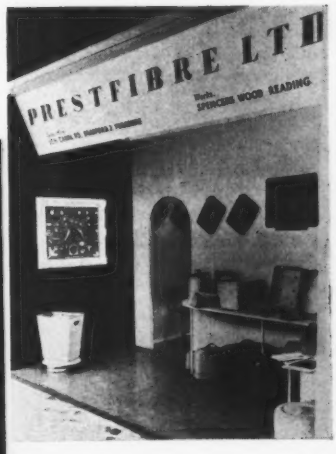
(Below) Storey Brothers & Co., Ltd.



(Above) Rosedale Associated Manufacturers Ltd.

(Above) J. W. Roberts Ltd.

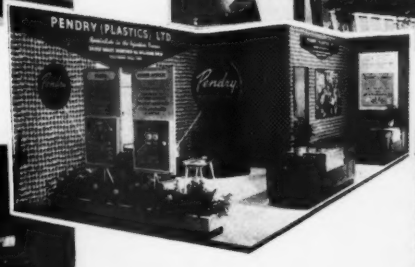
(Below) Prestfibre Ltd.

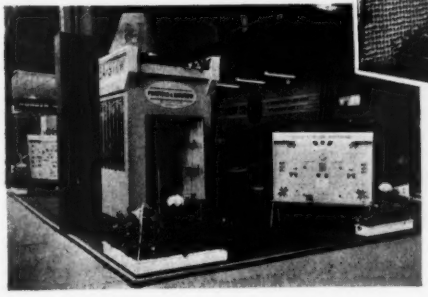


(Above) Siemens Ediswan Ltd.

(Below) Punfield & Barstow Ltd.

(Above) Stanley Plastics Ltd.





(Above) Pendry (Plastics) Ltd.

(Right) The Patent Pulp Manufacturing Co., Ltd.

The **Patent Pulp Manufacturing Co., Ltd.**, included on their stand many industrial mouldings of glass reinforced polyester resins.

A large glass reinforced polyester container for a life raft was shown by **Cascelloid.** This, together with other mouldings and their well-known Cascalite roof lighting material, exemplified their activity in this particular field.

Besides the decorative laminates shown by **Perstorp Products (Great Britain) Ltd.** there were some attractive glass fibre reinforced polyester trays in which a printed fabric had been superimposed.

Thermo-Plastics Ltd. showed a 500-gallon capacity resin bonded glass marine water tank. The unit has been deliberately designed in a very robust manner since in service it will undergo heavy wear and tear. The tank is for use both in ships and on quaysides, and larger tanks can be manufactured.

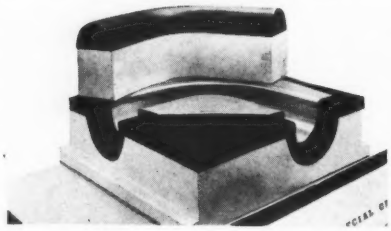
One of the interesting items shown by **Ashdowns Ltd.** and manufactured by their associate company, **Mendip Engineering Ltd.**, was a large viewing window constructed for the Atomic Energy Research Establishment at Harwell, designed to serve as a biological shield. When in use the interspace is filled with a highly purified liquid. This unit was constructed from glass polyester laminate, the inside being surfaced with epoxy resin.

Feroglas polyester glass cloth mouldings and hand fabricated articles were exhibited by **J. W. Roberts.** These exhibits included the Amanda water scooter hull and drop tanks for the Hawker Hunter fighter.

One of the attractive features on the stand of **Microcell Ltd.** was the front section of a sports car body, rotating so that it could be examined from all angles, and manufactured from materials produced by member companies of the Microcell group.

Marston Excelsior Ltd., a subsidiary company of Imperial Chemical Industries, showed a very interesting press tool cast in epoxy resin. This unit, a photograph of which is shown above, has been in continuous production for the pressing of heavy gauge light alloy sheet material.

Buchner funnel in glass reinforced polyester shown by Ashdowns Ltd.



Epoxy press tool shown by Marston Excelsior Ltd.

The centre piece of the **Bristol Aircraft Company's** stand was a rocket tube made from epoxy resin reinforced by glass fibre.

Vinyl Materials

THE Fablon self-adhesive flexible plastic covering was displayed by **Fablon Ltd.** This material is an ideal "do-it-yourself" product and can easily be applied to any clean smooth dry surface. Fablon p.v.c. curtaining was shown in a number of attractive designs.

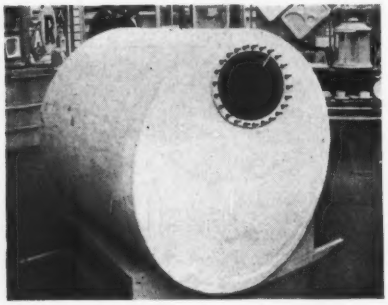
Commercial Plastics (Sales) Ltd. displayed Fablon p.v.c. film and Superlon sheeting plain, embossed, printed and laminated p.v.c. film which is available for supply to the making-up trades. A wide variety of extruded sections from p.v.c. for an extensive range of industrial applications as well as in the manufacture of beading for travel goods and all forms of upholstery, etc., was also exhibited.

Vicrtex vinyl coated fabric for wall decorations, upholstery, shoes and fancy goods and Plasoco vinyl impregnated fabrics for marine oilskins were exhibited by **Ioco Ltd.**

Rigid and flexible p.v.c. mouldings were exhibited by **J. F. Kenure Ltd.** These included vacuum cleaners and washing machine components.

Extrudex Ltd. showed a range of rubber modified p.v.c. pipe fittings, manufactured on a special machine developed by the company, and being made in a range of sizes from ½ in. to 3 in. bore. The rubber modified p.v.c., or H.I. p.v.c. as it is sometimes called, exhibits very good chemical resistance, and with the complete range of pipe fittings now manufactured by Extrudex offers considerable scope for installation in chemical plant.

Another interesting exhibit was **Lacrinoid** Vietum p.v.c. shrink sleeving which shrinks up to 80% on its expanded size. It has domestic applications, e.g. covering for tubular chairs, etc., and industrial applications, e.g. signal lever handles, condensers, etc.



A 500-gallon tank shown by Thermo-Plastics Ltd., made from glass reinforced polyester.

A number of hygienic trays, etc., and a novel three-dimensional display card for Eno's Fruit Salts vacuumed formed from rigid p.v.c. sheet, were shown by **Cellgrave Co., Ltd.**

Chemidus Plastics Ltd. featured highly coloured piping in a wide range of sizes, from ¼ in. to 14 in. diameter, extruded from Chemidus 2000 unplasticized p.v.c. In addition to a display of this piping used for underground services, piping from Chemidus H120, a new modified high-impact p.v.c., was shown.

A very wide selection of mouldings and extrusions in p.v.c. formed the principal exhibit of **Hellermann Ltd.** A recent introduction of theirs was a radio handle which consists of a p.v.c. strip with a spring steel insert held in place by metal fittings. The majority of the mouldings were for industrial purposes.

The **Phoenix Rubber Co., Ltd.**, besides showing a wide range of p.v.c. floor tiles, introduced a new covering which is made from special compounds based on Hypalon. One of its advantages is that it is easily cleaned, resistant to burns and has improved stain resistance.

Many examples of flexible and rigid p.v.c. extrusions were shown by **C. & C. Marshall Ltd.** Amongst these were wing pipings for the motor car industry, insulated sleevings for the electrical trade, special rigid sections for the caravan trade and escutcheon beadings for radio and television sets.

Storey Bros. & Co., Ltd. showed many new patterned p.v.c. fabrics of the unsupported variety. These included the Storella p.v.c. curtaining materials printed on both sides. A variety of p.v.c. coated fabrics including p.v.c. coated nylon were also shown. Many of these, in entirely new designs, were designed for the upholstery trade. One of the new products to be shown this year and not seen before, was the new self-adhesive plastic sheeting known under the trade name of Con-Tact.

Besides the wide selection of p.v.c. sheeting for domestic uses shown by **Greenwich Plastics Ltd.**, a selection of Craytherm unplasticized p.v.c. sheet for vacuum forming was exhibited. A description of this sheet for packaging was given in February, 1957, issue of *Plastics*.

Richard E. Du Pont Ltd. showed extrusions in rigid p.v.c., flexible p.v.c. and nylon designed for many applications including cold water systems and chemical plant. The company also showed the full range of pipe fittings injection moulded in the relevant materials and designed to be used with the extruded products.

Rilflex, Rilon and Leonex p.v.c. conveyor beltings were exhibited by **Rubber Improvements Ltd.** Miners' knee-pads, pithead bath sandals and a wide range of fine embossed, printed and multiple laminated sheeting p.v.c. for rainwear and fancy goods' manufacturers were displayed. Other exhibits included Rilite roofing material and rubber floor tiles.

A new product of **Whiffen & Sons, Ltd.**, shown for the first time at this exhibition, was the Fi Vi foamed p.v.c. material. Examples of its application included fishing net floats, its use as an interlayer in boat construction and various other industrial applications.

An attractive selection of printed p.v.c. fabric and coated materials was shown by **Industrie Riunite Sant' Antonio S.p.A.** The strong patterns and continental designs were well received by visitors.

Materials seen at the Exhibition

For convenience we have segregated the report on raw materials under the following headings: Compression Moulding Materials; Resins for Reinforced Plastics; Injection Moulding Compounds; Extrusion Compounds; Thermoplastic Sheet; Dipping Sintering and Spreading Compounds; Films, Foils and Monofilaments; Emulsions and Foams; Casting Resins; Plasticizers, etc., and Additives. In addition to the material published here, further important reviews of materials at the Exhibition will appear in the September issue.

Compression Moulding Materials

ONE of the newest developments was the B.I.P. polyester dough moulding compound, marketed under the serial number DMC6001. Provisional technical information on this material was issued on July 5 by **B.I.P. Chemicals Ltd.** The dough moulding compound has been satisfactorily employed under normal compression moulding techniques, at pressures of from 0.5 to 3 tons p.s.i. and temperatures of from 290 to 310° F. The material flows easily and rapidly under these conditions but sets quickly. Fairly fast closing presses are recommended owing to the rapidity with which the material tends to cure when in contact with the hot mould surface. It has been reported that the material transfers satisfactorily.

Cures of about 1 minute at 300° F. appear to be necessary for mouldings ¼ in. thick, but the material withstands temperatures as high as the mould temperature indefinitely without deterioration and thus it withstands curing times considerably longer than the minimum without ill effect. Some physical properties expected to be obtained when using this material were issued by B.I.P. Chemicals. The specific gravity will be about 2, tensile strength 7,000 to 9,000 lb. p.s.i., impact strength 2.8 to 4 ft./lb. measured by the Izod test and mould shrinkage of from 3 to 5 mils. per inch. After shrinkage, 48 hours at 100° C., is expected to be less than 1 mil. per inch. The track resistance is expected to be very good and test specimens have passed both E.R.A. and B.S. 1322 tests easily. The heat resistance of mouldings made from this material indicate that mouldings darken slightly in colour after periods at elevated temperatures but withstand exposure at 180° C. almost indefinitely without deterioration in mechanical strength. Sample mouldings were shown in the stand, and included a fuse box cover, a switch base, a switch bar, a top of a sweet jar container, and equipment for electric lighting plant. The material is available both coloured and uncoloured and the glass filler comprises fibres of approximately 1 in. in length. Storage is up to one year depending upon the conditions.

Information was issued by **B.I.P. Chemicals Ltd.** on March 6 dealing with a new powder, L1458, a melamine nylon-filled material. Examples of this in moulded form were shown, and some of the properties of the material will be of interest. The specific gravity is 1.3, bulk factor 4 to 5 to 1, electrical break-down strength volts per mil., 40 to 80, track resistance excellent, mould shrinkage 1.1 to 1.4%, after shrinkage that is at 48 hours at 100° C., 0.4 to 0.8% and water absorption milligrams measured at 30 minutes boiled at 100° C., 30 to 70. Impact strength ft./lb. Izod test 0.40 to 0.60.

A complete range of moulding powders was shown by **James Ferguson & Sons Ltd.** and examples of moulded products included a phenolic radio cabinet moulded by the Witton Moulded insulation works of G.E.C. Ltd., a green urea lavatory seat moulded by Robert McArd and phenolic telephone equipment moulded by the Phoenix Telephone Co., Ltd.

Urea moulding powders Supertone C which has a special cellulose filler and Supertone B, both for translucent and opaque mouldings were displayed by the manufacturers **Lacrinoid Products Ltd.** Moulded products such as buttons and bottle closures in bright colours illustrated the use of these two materials.

Resinous Chemicals Ltd. featured their Plaskon alkyd moulding compounds. Shown for the first time was a white alkyd moulding powder AMC426. Telephones made from this material have been approved by the General Post Office. Mouldings for the Singer sewing machine were shown made from Plaskon AMC488 a low shock decorative grade. The complete range of alkyd moulding compounds included AMC420 a granular grade, AMC440A a glass filled self-extinguishing grade and a general purpose putty AMC411. RCL alkyd moulding compounds are fast curing and require low moulding pressures. Mouldings have exceptionally high impact strength with good electrical properties. A complete range of phenolic moulding powders was shown which give mouldings with exceptional gloss.

Resins for the shell moulding process and for the manufacture of grinding wheels were also displayed.

British Oxygen Chemicals Ltd. emphasized the improvement in design of melamine ware for tables. Some very attractive American examples of decorative ware were shown and these included some beer-pump handles as well as normal tableware. It will be recalled that melamine tableware received a " Design of the Year " award recently.

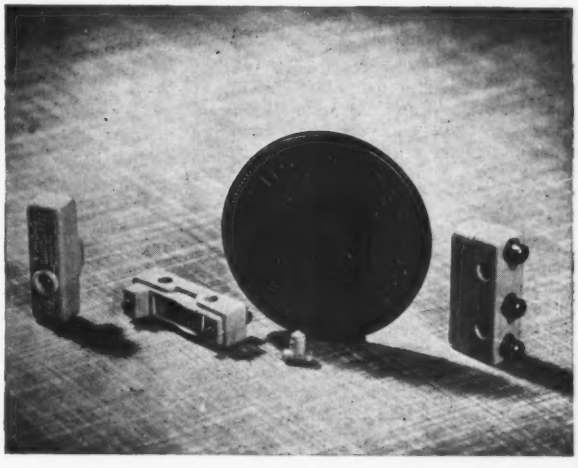
Resins for Reinforced Plastics

A SPIRAL history of their resins formed a centrepiece to the **Scott Bader and Co., Ltd.** stand. The first important resin manufactured in 1946 Marco 26 is still being produced. New resins introduced this year are Crystic 196 for vehicle manufacture by hand lay-up and Crystic 212 for hot moulding. Scott Bader resins are used in the construction of the Bristol Britannia, Rover T3 turbine car body and ships' lifeboats, etc.

Resinous Chemical Ltd. showed their range of Wresinol 11,000 series of polyester resins. Wresinol 11,004 was designed specifically for the manufacture of translucent roof sheeting. An attractive poster laminated between two translucent polyester glass-cloth sheets was shown. A remarkable three-dimensional effect was obtained when the poster was illuminated from behind.

The Shell Chemicals Ltd. stand showed many examples of the use of Epikote resins in the potting of electrical and electronic components. By potting delicate coils and other components it has been found possible to provide both an insulating material and to give the component a robust casing. Besides the use of Epikote resins for potting, examples of their use as laminating resins were shown. These included pipes and fittings as well as jigs and tools used in aircraft and other industries.

Artrite Resins Ltd. showed a comprehensive series of basic polyester resins one of the most interesting of which was a glass-filled polyester

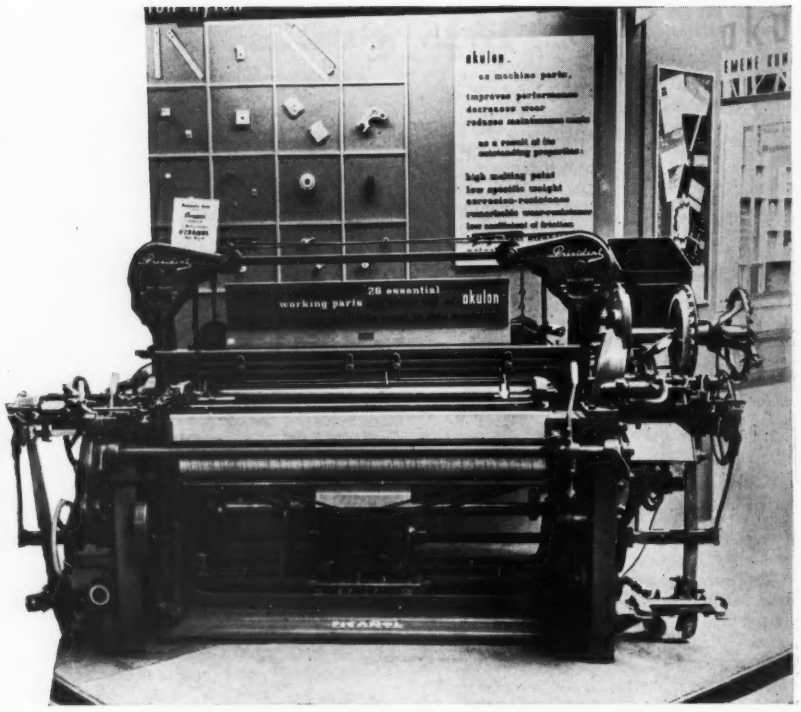


Miniature micro-switches, compared here in size with a half-crown coin, are moulded in Plaskon alkyd material manufactured by Resinous Chemicals Ltd.

or phenolic premix compound ready for use by conventional compression or transfer moulding techniques. This group of materials comprises a general purpose polyester premix for mechanical and electrical properties, a self-extinguishing grade a cheaper grade polyester premix having lower mechanical strength but good electrical properties plus two phenolic premixes containing glass.

A feature of the **British Resin Products Ltd.** stand, was the sportscar body suspended in mid-air, which when standing on the ground could be seen completely from the underside, and when standing on the first floor of the stand, could be seen on top. The beautiful finish obtained with this reinforced plastic structure was evidence of the high quality of the polyester resins manufactured by British Resin Products Ltd. Marketed under the trade name Cellobond, these polyesters have been developed over a period of some years, and are now used in quantity to provide strength, low weight characteristics, resistance to corrosion and easy fabrication.

Beck Koller & Co. Ltd. exhibited various glass fibre reinforced polyester resin products in which their polyester resin had been employed. These included the L.C.C. Ambulance, a sports car body, a dodgem car body, helmets, road signs, sink units and other smaller items.



Loom equipped with many parts in Akulon nylon.

Injection Moulding Compounds

STANDARD acetyl and high acetyl grades of cellulose acetate moulding powders were exhibited by **Courtaulds Ltd.** The standard acetyl grade is produced in two qualities, normal quality, a general purpose powder and special quality, prepared to yield articles of high clarity. The high acetyl grade powder gives high lustre and transparency plus a higher dimensional stability.

S.I.C. Plastics Ltd. showed moulding powders manufactured by **Mazzucchelli Celluloide S.p.A.** Sicostirol 951 a general purpose and Sicostirol 510 impact grade polystyrene moulding powder and Sicalit cellulose acetate moulding powder were shown.

Ladies' shoe heels for Meteor Shoes and Perdio transistor pocket radio cases moulded from Kleestron Super 44 impact polystyrene were exhibited by **Kleestron Ltd.** as examples of the uses of this material. Attractive pearlescent wall tiles and a picture made from granules of polystyrene moulding powder decorated the stand. Mouldings from general purpose polystyrene included pennants for British European Airways and Wilkinson razor blade dispensers. The Guinness Toucan display emblem vacuum formed from preprinted polystyrene sheet and lighting diffusers from Kleestron DS de-statisized polystyrene were also shown.

Among the vinyl compounds shown by **Vinatex Ltd.** was the type HY which has been recently developed for transfer moulding and for processing by the new low pressure injection moulding technique. Examples of shoes and sandles using this material were displayed. Three grades of this material are available having hardness figures of 65, 60 and 50 and specific gravities of 1.22, 1.25 and 1.32 respectively.

A Gestetner duplicating machine was a feature of the stand of **Algemene Kunstzijde Unie N.V.** of Arnhem, Holland. This machine was shown in working order and is equipped with a large number of mouldings made from Akulon nylon moulding material. Eleven parts employ Akulon, used here to provide high wear resistance with a low co-efficient of friction coupled with good appearance. The component mouldings employed were also featured in a separate display adjacent to the machine to indicate clearly the type of unit employed.

A Remax knitting machine manufactured in Austria was also a feature on the stand of **Algemene Kunstzijde Unie N.V.** and it contained many parts injection moulded from AKU nylon. A much larger piece of equipment, a loom, was shown which employed 26 parts manufactured from Akulon, used because of lower costs, better wear resistance, low co-efficient of friction and because lubrication is not required.

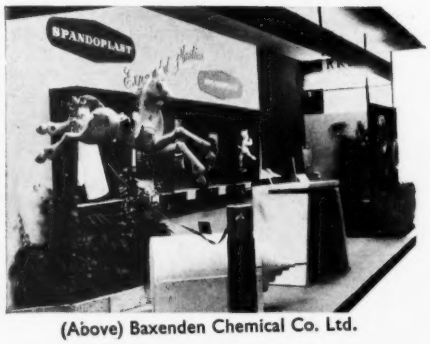
A wall telephone moulded by Birkbys Ltd. for Modern Telephones illustrated the versatility of Tenite cellulose acetate butyrate injection moulding powder. Other products from this material were shown on the **Kodak Ltd.** stand including shoe heels, pens, tools for the garden and workshop and a television screen.

One of the most attractive features on the stand of **Erinoid Ltd.** was the new miniature railway manufactured by Rovex, employing Erinoid high impact polystyrene. This material has been found to be eminently suitable for the moulding of the complicated and extremely fine detailed rolling stock and locomotives manufactured in this series by Rovex. It is also employed for the moulding of the rail bases. A feature of this range of trains is the attention to detail that has been paid in the manufacture of the moulds. As precise scale models, they will rank very high in the mind of the enthusiast, and it is no small tribute to this high impact grade of polystyrene that it has been selected for this purpose. Among many other favourable properties conferred by this material, is the valuable one of high impact strength, which will be found of the greatest value in reducing accidental damage and breakage to these toys.

Grist reprocessed p.v.c., cellulose acetate, polystyrene and polythene were displayed by **Dohm Ltd.** These materials are available in a wide range of colours.

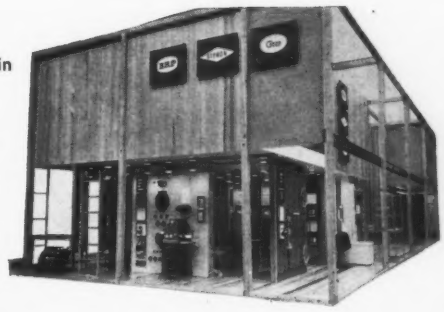
Whiffen & Sons Ltd. exhibited for the first time a number of products injection moulded from their Ralsin nylon 11. Ralsin superpolyamide is derived from 11-amino undecanoic acid and there are five basic grades available for injection moulding. Grade B.M.N. gives rigid mouldings with excellent mechanical properties, good electrical insulation and maximum chemical resistance, grade B.M.F. for fine and complex mouldings which is very fluid at moulding temperatures, grade B.M.N.P.20 and B.M.N.P.40 are plasticized grades the latter giving products of high shock resistance and grade G.8 is a graphited grade particularly suitable for gears and bearings. The non-black grades are available in 30 different colours and in addition can be prepared as G. grade which contains fungicide, T. grade which is heat resistant and L grade which is specially resistant to U/V light; mouldings shown included sterilizable surgical goods, gears and pinions and electrical components.

A picture story of the uses of the **Allied Chemical & Dye Corporation's** A.C. polyethylene in natural and synthetic rubber was displayed by **Kingsley & Keith Ltd.** A.C. polyethylene is available in molecular weights

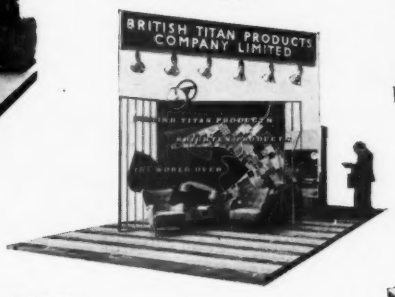


(Above) Baxenden Chemical Co. Ltd.

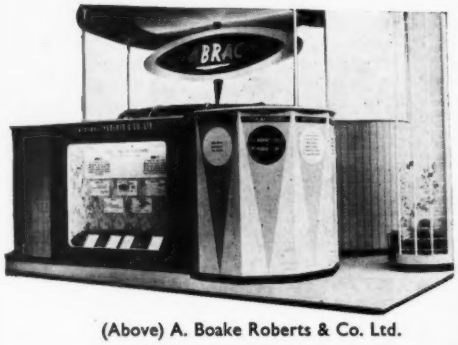
(Right) British Geon Ltd., British Resin Products Ltd. & Distrene Ltd.



(Below) British Titan Products Co. Ltd.

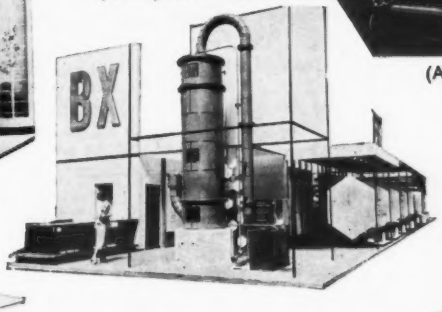


(Above) Algemene Kunstzijde Unie N.V.



(Above) A. Boake Roberts & Co. Ltd.

(Below) BX Plastics Ltd.

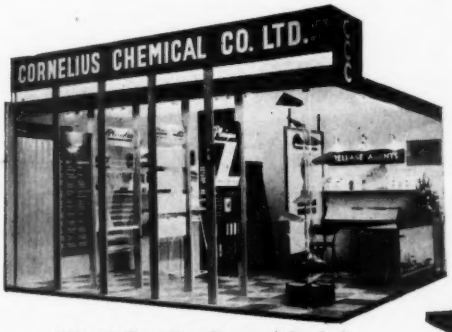


(Above) Beck Koller & Co. Ltd.

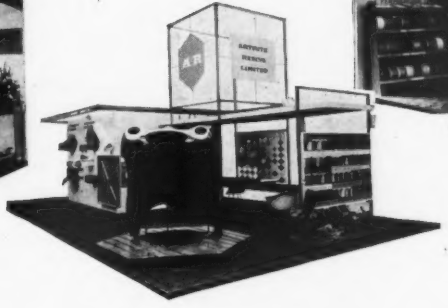
(Above) B.I.P. Chemicals Ltd.

(Below) British Oxygen Chemicals Ltd.

(Above) Briggs & Townsend Ltd.



(Above) Cornelius Chemical Co. Ltd.



(Left) Artrite Resins Ltd.

varying between 1,600 and 5,000 as an injection moulding aid when blended with ordinary polyethylene. It gives shorter moulding cycles and gives a better finish to mouldings. When used in rubber A.C. polyethylene allows higher extrusion speeds, gives a glossy finish, gives better dispersion of compounding ingredients, reduces shrinkage and prevents mill sticking; it is compatible up to 10 parts per 100 elastomer.

Cellulose propionate moulding compounds were one of the features of the **British Celanese Ltd.** stand. These materials combine the strength and moulding characteristics of the cellulosics with the advantages of excellent dimensional stability and surface hardness. Two series are available, the J.M. series having flow temperatures varying from 179° C. to 145° C. and the J.L. series with flow temperatures varying from 183° C. to 174° C.

The **I.C.I.** stand, one of the biggest in the exhibition, showed visitors the many uses to which their polythene, p.v.c., nylon and acrylic moulding compounds are put. Specific industries were taken and mouldings used in these industries displayed.

Grilon & Plastic Machinery Ltd. had an exceptional display of nylon mouldings and extrusions. These were all made from Grilon nylon compounds and were excellent examples of the facility with which these compounds can be formed. A full description of their properties and their manufacture has been published in *Plastics*, June, July and August, 1956, and April and May, 1957.

Designed as an alternative to leather bicycle saddles **Grilon & Plastics Machinery Ltd.**, exhibited a nylon bicycle saddle top as an example of the use of this material. Injection moulded by Cascelloid for Lycette saddles in a special grade of Grilon nylon it is unaffected by moisture and retains its strength when wet.

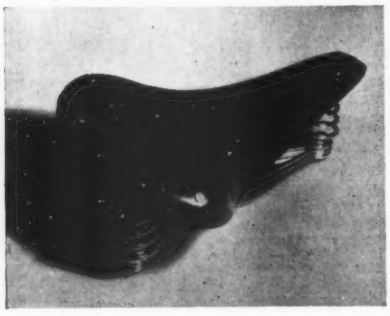
The falling ball test was employed by **Distrene Ltd.** to demonstrate the strength of the high impact range of Styron injection moulding and extrusion compositions. Many examples were also shown demonstrating the use of the general purpose crystal material.

A feature of particular interest concerning the Styron range of materials is the fact that they have been employed, as reported at a recent lecture given before the Plastics Institute, in experiments dealing with thin wall moulding. In the hope that a successful attempt may be made to compete with the wax paper industry in the packaging field, much research work has been carried out in the use of polystyrene for moulding very thin wall containers.

Monsanto Chemicals Ltd. featured Lustrex polystyrene in six grades, including Lustrex T.11. In addition to many conventional mouldings such as refrigerator parts, household goods, toys and electrical components, new applications for Lustrex were displayed to indicate future trends in the use of this versatile material.

Lustrex T.11 was shown in the form of shoeheels. In this very large market, heels manufactured from polystyrene offer increased impact resistance, take nails better, are moisture resistant, have consistant high quality, and are easily moulded in a variety of shapes.

Röhm & Haas G.m.b.H. Plexiglas range of cast acrylic sheet, rod and tube, Plexigum acrylic injection moulding powder and extrusion compounds, and Plexidur polyacrylonitrile for orthopædic aids, particularly for supports, etc., were exhibited by **Cornelius Chemical Co., Ltd.** A new release agent Mould Wiz! was also shown by this company.



Bicycle saddle moulded in Grilon nylon.

Extrusion Compounds

FEATURED on the stand of the **Shell Chemical Co., Ltd.**, was the Shell polythene material developed to meet the requirements of fabricators for such processes as extrusion, injection moulding, etc. Shell is the only U.K. company to hold a licence for the Ziegler type high-density polythene and the company is now manufacturing at Partington, Manchester, three grades of polythene, the 800 series having a melt index of 2, the 500 series having a melt index of 0.2, and the 200 series having a melt index of 0.02. These melt indexes have been determined under the B.S.1973:1953. Extensive technical literature has been prepared by the company and the Thermo plastics Bulletin number 2 gives some typical properties of Shell polythenes. Bulletin number 4 deals with the injection moulding of Shell polythenes, in which they offer several advantages. The main characteristic of the range is high-tensile strength, stiffness and high heat resistance, properties deriving mainly from the greater crystallinity of the material. As a result of these properties, articles injection moulded from Shell polythenes combine all-round toughness with rigidity and excellent appearance. Moreover the mouldings retain their shape when immersed in boiling water. A general technical booklet entitled "Shell polyethylene" is also available from the company giving extensive information about applications, properties, moulding techniques and the like.

Shell Chemical Co., Ltd., also exhibited examples of the uses of Carina 16 p.v.c. in calendered products and extrusions.

Examples of pipe, monofilament, wire covering and brush fillings from Ralsin nylon 11 were shown by **Whiffen & Sons Ltd.** Special grades are available for extrusion. Grades BEC, BEC.P.20 and BEC.P.40 are manufactured for wire covering and grades BES(N) and BES(A) for the extrusion of film, tube and pipes, BES (A) is a guaranteed food grade.

Wallington Weston & Co. Ltd. introduced at the exhibition a new vinyl based copolymer resin. Initial reports indicate that this material Fromoplas H.T. has very high strength and toughness characteristics. By Izod measurements its impact strength is reported as being many times that of any other thermoplastic material available in quantity production. It can be moulded, extruded and formed without any difficulty.

This company also exhibited embossed p.v.c. sheeting as an imitation leather as well as thin sheeting for raincoats and domestic uses.

Together with their injection moulding powders **Monsanto Chemicals Ltd.** exhibited their polystyrene extrusion grades. Lustrex T.6, specially produced for the extrusion of sheet, is used to form moulds for poured concrete shuttering, and the role played by vacuum formed polystyrene sheet in this recently developed technique in modern building construction was shown. Other new applications for Lustrex included a vacuum formed water tank and colourful hardwearing terazzo flooring.

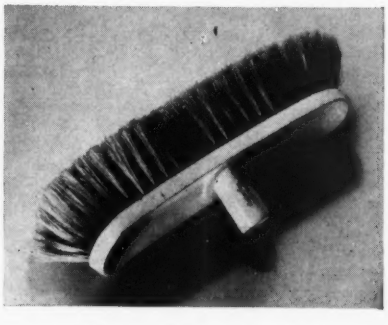
The formation of moulds employing Lustrex T.6 for concrete shuttering is a development that has been widely studied recently and was employed in the construction of the Bristol Corporation's Barton Hill flats site. Moulds from this material were used to cast the concrete walls. The moulds measured approximately 4 ft. × 3 ft.

Lustrex shuttering eliminates the lines and irregularities in concrete surfaces which occur with wooden shuttering and it is simple to incorporate design features in the concrete. Tubing from Lustrex T.11 was shown, and it was demonstrated that it can be joined by hot gas welding. More rigid than polythene, this type of tubing presents no toxicity problems and has recently been installed with great success in a large London brewery.

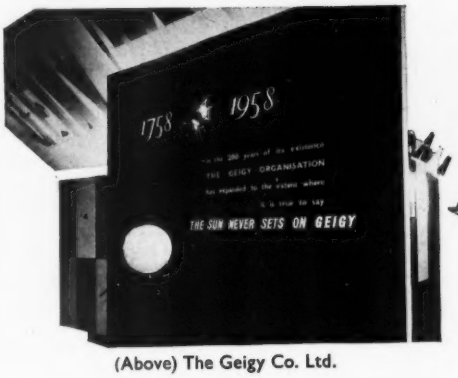
Included in the display of finished products shown by **I.C.I. Ltd.** were several extruded components from Maranyl nylon compounds. There are several grades of this material based on type 66 and type 610 nylon or copolymers of the two each grade having certain specific characteristics.

Thermoplastic Sheet

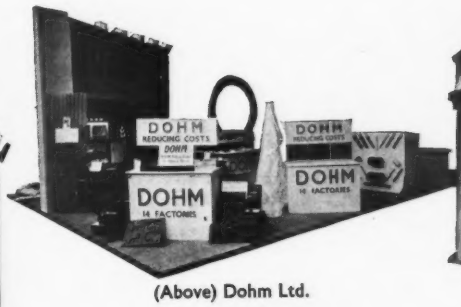
ONE of the biggest exhibits shown at the exhibition was a fume tower, part of a nitric acid recovery plant, designed to deal with vapour laden air from a cellulose nitration process. The whole unit, shown here by **B.X. Plastics Ltd.**, was constructed from Cobex



Domestic brush with tufts in Grilon monofilament.



(Above) The Geigy Co. Ltd.

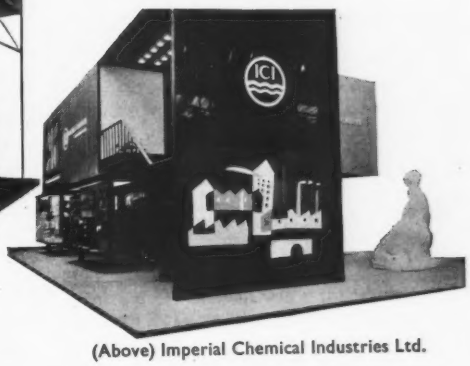


(Above) Dohm Ltd.

(Above) Jablo Plastic Industries Ltd.

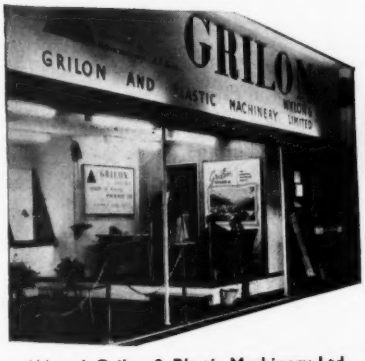
(Above) Fothergill & Harvey Ltd.

(Above) Glass Yarns & Deeside Fabrics Ltd.

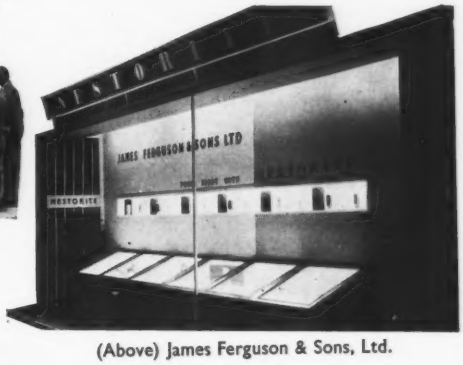


(Above) Imperial Chemical Industries Ltd.

(Above) Fibreglass Ltd.



(Above) Grilon & Plastic Machinery Ltd.



(Above) James Ferguson & Sons, Ltd.

(Below) Distillers Co. Ltd.

(Above) Croxton & Garry Ltd.

(Right) Part of the Courtaulds Ltd. stand.

p.v.c. material, selected because of the expense and long delivery of stainless steel and because of the unsuitability of other materials due to difficulty of maintenance. Since Cobex can be welded in a way similar to metal, maintenance repairs are easily accomplished.

Comprising three main sections, the bottom being made from $\frac{1}{4}$ in. Cobex, the centre section from $\frac{3}{8}$ in. Cobex and the top section from $\frac{1}{4}$ in. Cobex, a complete unit was a typical example of a major constructional feature employing Cobex material throughout.

Cobex was also employed by B.X. to sandwich expanded metal thus giving a transparent structure which at the same time had high load bearing properties. A sample of this type of construction was shown on the B.X. stand, a chemical washing tank which was constructed throughout of Cobex, the sides and base having the interlayer between two sheets of Cobex of expanded metal. This type of structure provides great strength, chemical resistance and excellent visibility.

Saro Laminated Wood Products Ltd. stand was constructed entirely of Saro products, namely Saropane corrugated roofing sheets, Medino office partitioning and Medino acoustic ceiling materials. Refrigerator liners and doors formed from Saroy H.I. polystyrene sheet were exhibited together with shuttering for the building industry. A colour film was shown on a Movietel of the manufacture of Saroy products. Dowpac, trade name of Dow Corning for a new material for packing gas liquid contact towers, was shown for the first time.

A comprehensive range of sheet materials produced by **Mazzucchelli Celluloide S.p.A.** including styrene, p.v.c., acetate, celluloid and polythene in various colours was shown by **S.I.C. Plastics Ltd.** The versatility of these materials was shown by the large number of end products produced from them. These included domestic appliances, automotive electrical and radio parts. Sheets, tubes and rods of Sicodur unplasticized p.v.c. were also shown. This material has excellent chemical resistance, high thermal and mechanical properties and good dimensional stability. It can be employed for chemical resistance applications such as in electro chemical plants.

Iridon Ltd. showed a range of high impact polystyrene sheet for vacuum forming. Iridon impact polystyrene sheet is available in three different finishes together with Iridon decorative sheet which is printed on one side in six alternative designs. Iridon 1000 polythene sheet was shown together with Iridon L.T.1300 Ziegler polythene sheet.

British Celanese Ltd. showed examples of vacuum forming from their Celatron polystyrene sheet. This is a rubber modified high impact type of extruded sheet available with standard and high polish finishing and in widths up to 26 in.

Dipping, Sintering and Spreading Compounds

FEATURED on the stand of **The Telegraph Construction & Maintenance Co. Ltd.**, Plastics Division, was the Telcothene powder, which has been developed to give a smooth coating of polythene when applied to metal for reasons such as protective coatings, electrical insulators, for decorative purposes combined with ease of cleansing and freedom from staining, for the storage and packaging of foodstuffs, etc. Telcothene polythene powder employed in this process is finely divided polythene passing a 40 mesh screen and having a preponderance of 120 mesh size particles. The powder is therefore well graded and is suitable to provide uniform coatings. Pigments and dies can be mixed to give a range of colours as shown on the colour chart available from the company.

Three methods can be used in applying Telcothene coatings to metals. The first is the dip-coating method carried out by preheating the metal in an oven or by some suitable means to a temperature of 140 to 260° C. followed by completely immersing the portion to be coated in Telcothene powder, shaking or brushing off the excess powder not firmly adhering to it and fusing the retained powder to an even coat at 160° C.

An alternative method is spraying unheated Telcothene powder on to heated metal. The third method is by flame spraying employing a flame spray gun which causes the stream of powder to pass through a flame on to the metal preheated to a temperature of 200 to 260° C.

Properties of Telcothene powder coatings include melting point 110 to 120° C., density at 20° C. 0.92 gram. per cubic centimetre ultimate tensile strength 1,500 p.s.i. punch sheer strength 2,000 p.s.i.

Charles Lowe & Co (Manchester) Ltd. showed a wide range of resins manufactured in the phenol formaldehyde and urea formaldehyde range. Resins manufactured by this company are employed for battery separators, brake and clutch linings, castings, cork bonding, fibre boards, moulded pulpware, foundry shells and cores, grinding wheels, abrasive discs, electrical laminates, structural laminates, and many other applications. The company also showed alkyd resins for the production of *in situ* polyurethane rigid foams. These resins, made under licence from the National Research Development Corporation, are the result of research at the Royal Aircraft Establishment, Farnborough.

Films, Foils and Monofilaments

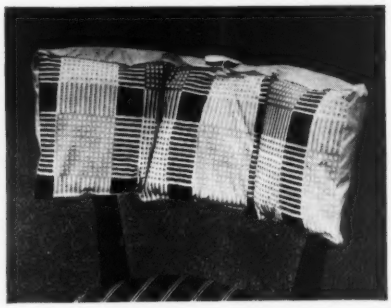
CELLULOSE acetate film which is marketed by **British Cellophane Ltd.** was exhibited by **Courtaulds Ltd.** This material is highly transparent, dimensionally stable and water resistant and is used for packaging.

Courtaulds Ltd. featured their Courlene and Courlene X3 polyethylene monofilaments and yarn. This material is tough and exceptionally inert to chemical attack. Courlene X3 is made from high density polythene with a higher softening and melting point than the standard Courlene. Fabrics made from it are resistant to boiling water. Highly coloured filaments can be produced by spin dying in a solution prior to its extrusion as a yarn. Courlene is used for protective clothing, pot scourers, deckchair fabrics, curtaining and upholstery materials, as well as ropes and haulage nets, etc.

Stanley Smith & Co. Ltd. showed a wide range of rigid and flexible sheet. Of special interest was Vitrone p.v.c. sheet, designed for use with high test peroxide. This important application has been developed for rocket propellants and fuels. Another interesting material shown by Stanley Smith was metal/p.v.c. laminated sheet, completely flexible and in a very attractive range of colours.

Metallized acetate for packaging and other similar applications was shown by **Utilex Ltd.** Examples of this metallizing process were also shown where Melinex polyester film had been used as a base.

A simple but very attractive application of p.v.c. was shown on the **B.X. Plastics Ltd.** stand. It was a high frequency welding of attractively patterned p.v.c. material, stuffed with kapok, and designed to fit on the top of deckchairs.



Colourfully-patterned welded p.v.c. sheet, shown by B.X.

An entirely new material aimed as a substitute for chromium plating and for insulation which is stable up to 250° C. was shown by **L. Richoux Co. (London) Ltd.** The material is an aluminium foil laminated between two polyester films and has been used for lining tea chests, insulating ships' holds and by leading car manufacturers in the U.S.A. for covering car bumpers and door handles. Richoux are the sole agents for **Dr. F. Raschig G.m.b.H.** who manufacture Stonex a mineral compound for patterns for vacuum forming. Examples of such patterns were exhibited.

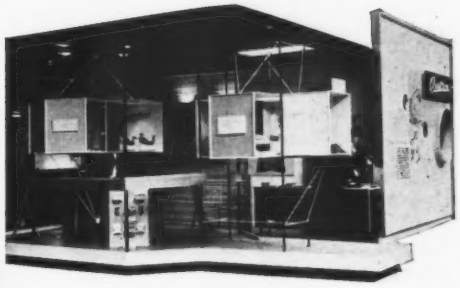
L. Richoux Co. (London) Ltd., displayed a metallized and iridescent cellulose acetate film in 12 different colours for vacuum forming and for the production of sequins, etc.

Kemitype Ltd. representing **Kalle & Co. A.G.** presented nylon, low-pressure (Ziegler) polyethylene and unplasticized p.v.c. film. Supronyl (superpolyamide film) has extraordinary surface hardness and abrasion resistance and can be sewn without danger of tearing out at the seams. Articles made from this material were displayed including baby pants, raincoats and packagings some printed and/or embossed. Deep drawn containers made from Suprotherm unplasticized p.v.c. film of exceptionally high clarity were shown together with samples of V.F. 56 Ziegler polythene film.

One of the most comprehensive displays of films and foils was that of **M. & B. Plastics Ltd.** who showed cellulose acetate, ethyl cellulose, polyvinyl alcohol, and other films, including metallized films. In the cellulose acetate field, materials were shown suitable for lampshade sheeting, transparent and coloured

(Above) Novadel Ltd.

(Below) Chas. Lowe & Co. (Manchester) Ltd.



(Above) Kleestron Ltd.

(Above) Kodak Ltd.

(Above) Monsanto Chemicals Ltd.

(Above) Resinous Chemicals Ltd.

(Above) Kingsley & Keith Ltd.

(Above) Marglass Ltd.

(Above) Lankro Chemicals Ltd.

(Above) Omni (London) Ltd.

(Left) M. & B. Plastics Ltd.

(Above) Reeves & Sons, Ltd.

film, sheet in a variety of colours and configurations, sheet materials with mother of pearl appearance, plain and graduated transparent coloured sheeting, and a special optical quality for sunglass lenses, etc., and laminated sheeting incorporating textile materials. The ethyl cellulose film was shown for use for adhesive tape bases and other technical applications. The polyvinyl alcohol films were shown in various grades of water soluble film for packaging and chemical resistant film for polyester glass fibre fabrication.

The metallized films under the trade names Mirralon and Meculon, were metallized cellulose acetate film in the first case, and metallized polyester film.

Ralsin nylon 11 monofilament, film, and fibres for brushes were shown by **Whiffen & Sons Ltd.** The continuous monofilaments are available under the numbers 7,000, 14,000, 17,000 and 38,000 and are available on bobbins containing about 200 grams. This material can be used for filter cloths, conveyors, car covers and tyre-cords. Fibres for brushes are obtainable in small bundles of long or short cut and varying between 15/100 to 50/100 mm. diameter. For the packaging industry Ralsin superpolyamide film is manufactured in tubular form in varying widths and thicknesses.

Duraplex Plastics Ltd. are very well known in the field of p.v.c. sheeting materials, particularly p.v.c. coated fabrics for upholstery, travel goods, for the shoe and car industry, etc., and unsupported vinyl sheeting in an extensive range of printed and plain embossed designs, both opaque and translucent. The exhibits arranged by this company included both supported and unsupported sheet materials in a variety of patterns, both printed and embossed. The embossed types employed in the manufacture of handbags, travel goods and other luxury articles. Duraplex Plastics also manufacture sheeting materials for packaging and industrial uses.

Emulsions, Foams

AMONGST the range of foamed materials shown at the exhibition, one of the leading exhibits was that of the **Baxenden Chemical Co. Ltd.** showing both expanded polystyrene, Spandoplast and expanded polyurethane materials. The expanded polystyrene is a white unicellular material which has made for itself a wide variety of applications including refrigeration insulation in cold stores, insulated containers and pipe sections, solid buoyancy in boats, lifebuoys and floats, and structural insulation panels in building. The material has also been employed with great success for display articles, for packaging and for toys. The material has the special advantage for many applications that it is rot proof, fungus resistant and does not attract vermin. The polyurethane material, Spandofoam, is manufactured from the isocyanate polyurethane materials now being marketed by I.C.I. Ltd. Stocks of raw materials are held at the East Lancashire plant of the Baxenden Chemical Co. and teams of technicians equipped with mobile foaming apparatus are available for carrying out operations to customers' specifications on site. Slabs of rigid Spandofoam are also available from stock in sizes 3 ft. × 1 ft. and 3 ft. × 2 ft. in thicknesses of from ½ to 6 in. and densities of from 3 to 6 lb. per cubic foot. Special attention was being paid to this display of foamed materials by those interested in the building industry.

The **Jablo Plastics Industries Ltd.** stand was constructed from Jablite (expanded polystyrene). This material can be used for internal and external insulation of buildings; it is non-inflammable, water-proof and can be adhered to all types of constructional materials, e.g. bricks, plasterboard, etc. Jablex expanded p.v.c. buoyancy material and Jablon expanded polyurethane upholstery material were also shown.

A new tear-resistant polyurethane foam was shown for the first time by **Leslie Gordon Ltd.** This foam has several advantages and one is that it can be machined in thin sections by conventional techniques without the stitches pulling through. Thin sheet material of two millimetres thickness was causing considerable interest and although it was not shown, one millimetre material can be obtained.

Volcrepe Ltd. were offering a new service to potential customers on their stand. This service is the laminating of two millimetre or upwards sheet polyurethane foam to cloth. This is being used we understand in the furniture, handbag and garment trade.

One of the leading features of the stand of **Styrene Products Ltd**, and shown for the first time, was the range of expandable polystyrene beads, marketed under the trade name Styrocell, and expanded polystyrene block. Both beads and block have wide application potentialities in such industries as building, refrigeration and the like. Expansions of up to 40 times the original bead size are obtainable and the materials can also be moulded and blown at the same time in order to give special shaped mouldings suitable for packaging delicate parts.

Casting Resins

ADVANCE information sheet number E18, issued by **Bakelite Ltd.** during the exhibition, deals with the production of plastic tools with epoxide resins. This bulletin is one of the most comprehensive to be issued by a raw material manufacturer and deals with materials required for making epoxide resin tools, the preparation of models and moulds, the methods of manufacturing the tools, precautions recommended when handling epoxide resins and hardeners, data on cured epoxide resin based castings and laminates, and a list of suppliers of ancillary materials.

Epoxide tools have come to an important point of development for the production of tools used in the engineering, foundry and sheet metal fabricating industries, primarily because they can be produced quickly to a high degree of accuracy directly from simple models or moulds made from wood, metal or plaster. Neither heat nor pressure is essential and machining and hand finishing operations are eliminated saving both time and cost. In the section dealing with the various methods of manufacturing the tools, complete specifications given for mixture formulations and complete directions are also given as to manufacturing techniques.

Plasticizers, etc.

BRITISH INDUSTRIAL SOLVENTS, a division of the **Distillers Co., Ltd.**, exhibited several new plasticizer compounds for p.v.c. Two of these Bisoflex 102 and Bisoflex 102a are specially compounded antistatic plasticizers. Both of these compounds considerably reduce the volume and surface resistivity of p.v.c. sheet. Besides this they have excellent low temperature properties and compared favourably with the sebacates. They are also fully compatible with p.v.c. and its copolymers up to 60 parts of plasticizer per 100 parts of resin. Bisoflex 102 is a triethylene glycol dicaprolate and 102a is a similar material being produced from a wider cut of caprilic acid to obtain a more economic material. A working model illustrating the effectiveness of Bisoflex 102 as an antistatic plasticizer compared with a normal type plasticizer was demonstrated.

Novadel Ltd. were showing among their many catalysts Lucipal which consists of 20% benzoyl peroxide mixed with an inert filler and is used in the polymerization of unsaturated polyester type resins. Other catalysts included Butanox which consists of technical methyl ethyl ketone peroxide dissolved in dimethyl phthalate (the peroxide is supplied as a 50% solution) and Cyclonox which is a cyclohexanone peroxide.

Attracting great attention on the **B.X. Plastics Ltd.** stand were the raincoats for men and women manufactured from Velbex reinforced with Terylene fabric. These are being made-up by a Manchester company and provide a range of properties far superior to those of the traditional unsupported p.v.c. rainwear garment. The appearance is much enhanced in the transparent grades by the interlayer of Terylene fabric. In addition to this raincoats made from this laminated structure have tremendous strength and should provide great resistance to tearing when in use.

Two new products were being shown for the first time by **A. Boake, Roberts and Co., Ltd.** These were the epoxidized oils and esters used in p.v.c. compounds details of which appear on page 343 of this issue of *Plastics*. The other new products were the Pliabrac plasticizers, Pliabrac 555 is a phosphate type plasticizer with good low temperature properties and heat stability. It has a low viscosity and is particularly suitable for the preparation of plastisols which have good shelf life but which cure rapidly at processing temperatures. Pliabrac 989 is an alkyd ester of a newly developed dibasic acid. This also is particularly notable for the excellent low temperature properties which it imparts.

Featured on the stand of the **Geigy Co., Ltd.**, was a range of plasticizers derived from sebacic acid and used both as diesters and polyesters. Sebacic acid polyesters were also shown used for the isocynate systems for the manufacture of polyurethane foams. In the plasticizer field, the sebacic acid derivatives are employed to confer low temperature flexibility, maximum resilience and low volatility. They also exhibited high resistance migration and extraction and are employed to soften rubbers and foams.

Many mouldings incorporating the titanium pigments were shown on the stand of **British Titanium Products Ltd.** Particular emphasis was laid on titanium oxide.

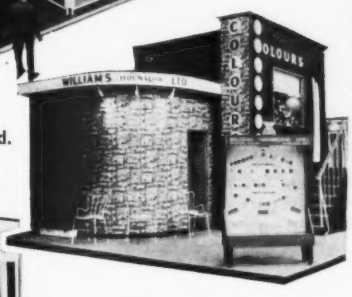
Courtaulds Ltd. showed their Courlose sodium carboxymethyl cellulose. This material is used for thickening and stabilizing dispersions, sizing and coating.

(Left) Rubber Improvement Ltd.

(Above) Shell Chemicals Ltd., Erinoid Ltd., Styrene Products Ltd., Utilex Ltd., Petrochemicals Ltd.

(Right) Scott Bader & Co. Ltd.

(Above) Saro Laminated Wood Products Ltd.



(Right) Williams (Hounslow) Ltd.

(Left) L. Richoux Co. (London) Ltd.

(Right) Stanley Smith & Co. Ltd.

(Above) S.I.C. Plastics Ltd.

(Below) Whiffen & Sons, Ltd.

(Below) Turner Brothers Asbestos Co. Ltd.

Kingsley & Keith Ltd. representing Advance Solvents & Chemicals displayed the story of Advastab vinyl stabilizers and Plastoflex plasticizers. New Advastab FT-37, a new concept in the stabilization of asbestos filled vinyl floor tiles was indicated. Other stabilizers include barium, barium-cadmium, barium-zinc, co-precipitated types for special purpose applications.

A complete range of **Pfizer** Citroflex plasticizers were illustrated by **Kingsley & Keith Ltd.** A special non-toxic plasticizer for food wrappings, etc., Citroflex A-4 (acetyl tributyl citrate) was given prominence in view of its importance in the packaging field.

Whiffen & Sons Ltd. presented Genitron N for low temperature expansion of epoxy resins for potting electrical materials. Genitron AZDN (Azo-diisobutyronitrile) is used for expanded rigid p.v.c. and Genitron AC for the expansion of polythene for use in flotation cable.

The Genitron range includes blowing agents for natural and synthetic rubber, soft p.v.c., etc.

Lankro Chemicals Ltd., are opening a new technical service laboratory to enable them to answer specific problems for the vinyl compounder. In association with the **Argus Chemical Corporation**, they manufacture stabilizers containing cadmium, barium and zinc complexes under the trade name Lankro-Mark stabilizers. In addition to the normal phthalate and sebacate plasticizers Lankro offered their new Lankro-Flex ED 3 epoxidized plasticizer. Lankro-Flex ED 3 is a low temperature plasticizer which is stable to heat and light, but it is not recommended as a sole plasticizer due to the risk of exudation under heavy mechanical stress on prolonged aging but should be limited to one-third of the total plasticizer when no exudation occurs under these conditions

Briggs & Townsend Ltd. featured the Diolpate range of plasticizers for p.v.c. compounds on their stand. These are special property plasticizers of the linear polyester series and can be compounded quite readily by all the usual processes. The Diolpates are compatible with p.v.c. up to the operation of 75 parts per 100 parts of resin.

A fire retardant plasticizer for cellulose acetate moulding powders, sheets and lacquers as well as other synthetic resins was exhibited by **British Celanese Ltd.** This material known as Syncela is trichlorethylphosphate.

Additives

A FASCINATING range of reinforcing materials was displayed by **Marglass Ltd.** They included industrial fabrics manufactured from nylon, designed for several applications including electrical insulation filter cloths and for coating with p.v.c. or neoprene, cloths made from polythene yarn which have special applications including resistance to rot and chemicals, resistance to abrasion, and complete non-absorption of water, industrial fabrics made from Terylene for high strength under both wet and dry conditions, good abrasion resistance, high temperature resistance, low water absorption and high modulus of elasticity, and fabrics made from glass yarns.

The Terylene fabrics are of special value for surfacing glass polyester laminates to improve their abrasion resistance and for certain other forms of plastics reinforcement in the aircraft and other industries.

The glass yarns are employed as cloths, tapes and sleevings. One of the most interesting products shown on the stand of Marglass was a valve body heating system fabricated from Marglass glass reinforcement material, bonded with polyester resin and manufactured by the De Havilland Aircraft Co. Ltd.

The **Fibreglass Ltd.** stand constituted one of the major displays by virtue of the four important mouldings shown, employing glass as the reinforcing medium. Perhaps the most attractive feature was the Alvis dashboard some 4 ft. wide, steel grey in colour and designed to take full advantage of the characteristics of the reinforcing agent. By using resin glass structures, Alvis have been able to conceive a design exclusive to the new moulding medium. Other attractive but more well-known items on the Fibreglass stand included a complete caravan which constituted the company's office during the exhibition, and an attractive 10 ft. dinghy which was floating in its own pool.

Afloat in a boat on the stand of Fibreglass Ltd., illustrating the use of glass cloth and mat.

Fabrics for use with polyester and Epikote resins were shown by **Fothergill & Harvey (Sales) Ltd.** They included staple and roving fabrics, and a chop-strand mat designed primarily for use with polyester resin structures.

The use of glass fibre as a reinforcing agent was exemplified by a motor boat and milk float constructed from this material. These were exhibited by **Glass Yarns & Deeside Fabrics Ltd.**

Durestos and Duraglas were the two principal products exhibited by **Turner Brothers Asbestos Co. Ltd.** Several products using these materials were displayed including technical mouldings, and a complete sports car body. Durestos is an asbestos/phenolic compound, and Duraglas a range of glass fibre reinforcing media.

Williams (Hounslow) Ltd. showed an increased range of Pollene compounds for the dry colouring of polystyrene. A special range of colours suitable for dry colouring of polythene and for the colouring by extrusion of polythene known as Ethypøl were also exhibited.

Exhibiting for the first time at the Plastics Exhibition **Reeves & Sons Ltd.**, featured a Tourette supreme 3-wheeler Cabin " Scooter " with an attractive green self-coloured polyester glass fibre body. Pigment dispersions in various media were shown together with panels representing the standard range of colours. A laminated chair designed and built by Aidon Duckworth and coloured by Reeves pigments was displayed. Pigments for polyesters are specially selected for their fastness to light and compatibility with the resin and can accelerate but not retard the curing rate.

Croxton & Garry Ltd. presented the **Omya** (coated whiting) range of fillers and extenders for p.v.c. compounds, polythene, polyester and epoxy resins and synthetic and natural rubber compounds. A special section of their stand was arranged as a testing laboratory where microscopic studies of Omya filler, etc., and physical testing on products containing these materials could be executed.

High and dry but none the less seaworthy, the smart dinghy in glass fibre/polyester materials shown by Bakelite Ltd., employing Bakelite polyester resins.

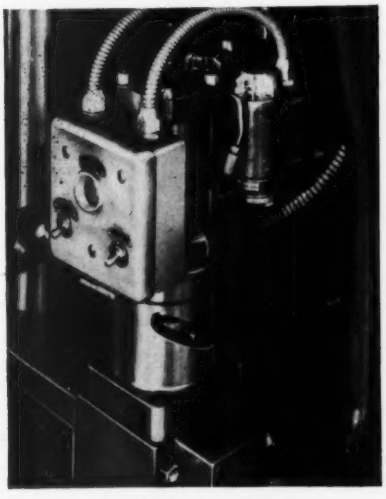
Owing to space limitations a number of important items are being held over to the September issue.

Machinery seen at the Exhibition

This review of plant and equipment is sectionalized as follows: compression plant, injection machines, extruders and take-off gear, vacuum forming machines, moulds and dies, pelleting and granulating machines, pre-heaters, mixers, hydraulic equipment, vacuum coating, welding, and miscellaneous machinery.

Compression Plant

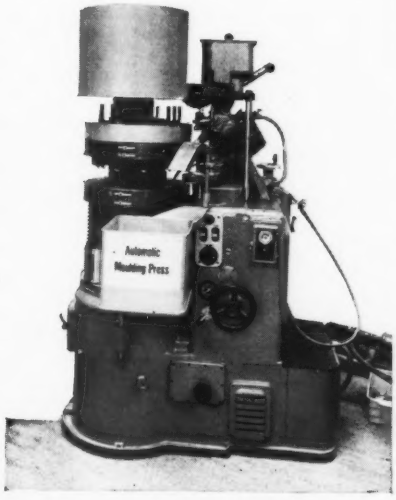
ONE of the leading features on the stand of **B.I.P. Engineering Ltd.** was the 60-ton fully-automatic compression moulding press. This improved machine, incorporating many novel features, excited considerable interest both on the part of home and overseas visitors. The power feed is situated on one side of the machine and stripper plates are fitted on the other, mounted in such a manner that they can immediately be swung clear to one side if access is required to the mould. The motion of the feeder is imparted by a hydraulic jack of short stroke the movement being magnified by a rack and pinion. Similarly the stripper plates are moved by short air jacks in which the stroke is mangified. A different mechanism is used for the stripper plates, incorporating a revolving arm. This imparts simple harmonic motion to the plates resulting in general acceleration and deceleration. Both stripper mechanism and the feeder mechanism are so mounted that they cannot only be swung out of the way but also adjusted up or down to suit the tool height. New features on this machine include improved tool accessibility, quick change over for top or bottom ejection, provision for accommodating large bolsters, standard heated bolsters with four, nine and 16 impressions being available, less overhang at the front of the press, smoother working of the feeder and stripper, instant change to semi-automatic working if required, and ease of setting making short runs a practical proposition. A brief specification of the machine includes a maximum daylight between tables of 30 in., a main ram stroke of 40 in., a maximum main ram load force of 63.3 tons and a maximum main ram pull-back force of 8.46 tons. The maximum area of tables is 19 in. by 21 in. and maximum working area between ejector rods 19 in. by 15 in. This Bipel press represents one of the most advanced designs of its type in the world.



New Bradley and Turton automatic press control.

H. Schubert Ltd. who are well known in the wood work and plywood industries exhibited a new 50-ton oil hydraulic plastics press, type SRP. This press has 18 in. by 18 in. platens and thermostatically controlled electric heating. A 100-ton low pressure press type MRL100 was also shown. The platens of this press are 8 ft. 2 in. by 4 ft. 2 in. and it has thermostatically controlled electric heating.

A rubber bag vacuum press for forming plywood or plastic sheet was also demonstrated.



Tavannes automatic moulding press.

The largest press on view at the exhibition was the **T. H. & J. Daniels Ltd.** 250-ton low pressure moulding press. This press was designed for use with reinforced plastic materials, the platens are 5 ft. × 8 ft. With a daylight of 78 in. and stroke of 48 in. It is a self-contained unit with the hydraulic equipment mounted on the head and incorporating an additional safety device which would not allow the press to fall under gravity in the event of hydraulic failure. A control system giving three mould closing speeds is fitted. The Daniels' 20-ton Alkyd Moulding Press (see *Plastics*, June, 1957, pages 210–11) was also demonstrated together with a 100/28-ton transfer moulding press. This press is semi-automatic, fitted with timer and hydraulic control valves which enables the complete moulding cycling to be set up and maintained, the operator loads and unloads the press and starts each cycle by closing the guard. It is self-contained and has 20 in. square electrically heated platens. A speed control valve giving controlled closing and a delay valve to facilitate breathing are incorporated.

Demonstrations of automatic compression moulding using **Tavannes'** 10 × 5 ton automatic moulding presses were given by **John Kimbell & Co., Ltd.** Threaded bottle caps were simultaneously moulded in 10 quintuple-cavity moulds using a Type B5 machine with a tablet feeding device. Press Type C with powder feed was used to produce non-screw bottle closures.

Bradley & Turton Ltd. were showing their fully automatic compression presses, a full description of which appeared in the October, 1956, issue of *Plastics*, pages 278–79. In addition they were showing an automatic time cycle press controller and can be fitted to existing self-contained presses. These controllers have standard time ranges of 1, 2, 3, 5, 15 and 60 minutes and are suitable for 200/250 volts single phase A.C. supply. An air line pressure of 80 p.s.i. is also required.

The fully automatic compression moulding press was exhibited by **Alexander Cardew Ltd.** This press which is manufactured in Milan by **A. Triulzi** has an automatic powder filling attachment and is controlled throughout its cycle by process timers giving maximum flexibility in operation.

Battenfeld automatic press.

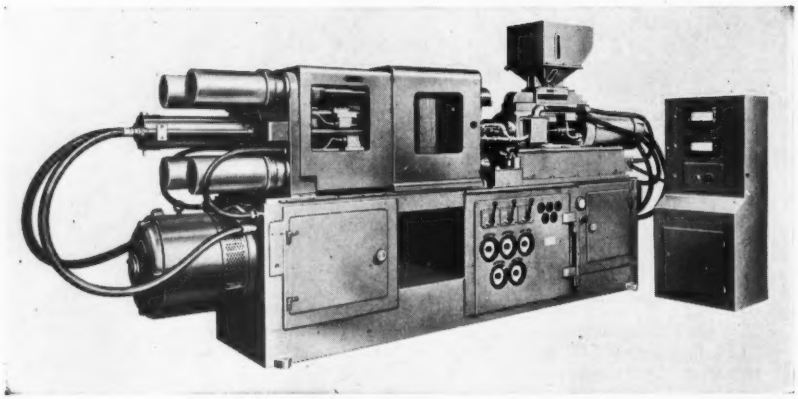
Three automatic compression moulding presses manufactured by **Battenfeld** were shown by **Ed. Brand Ltd.** These were the 50-ton automatic cycling press, the B.R.P.4, a four-head automatic machine for the continuous production of screw bottle caps, etc., and B.R.P.2, the twin-head machine similar to the B.R.P.4.

Injection Moulding Machines

ONE of the machines which attracted most attention at the exhibition, was the Foster-Wucher machine, series number W700. This is a low pressure injection moulding machine, manufactured by **Foster Yates and Thom Ltd.** and incorporating an extruding action for injecting the material into the moulds. The principle of the machine is the employment of a rotating table at the head of the orifice, incorporating the desired number of moulds. At the exhibition, the machine was being employed to mould complete sandals, and the number of tools set up was ten. In fact, any article normally injection moulded can be produced on this machine provided that the thickness is not less than 0.078 in. It is eminently suitable for the injection moulding of such materials as plasticized p.v.c., polythene, polystyrene, and cellulose acetate. By employing the screw principle, in conjunction with the heating elements on the barrel, the material to be moulded is brought to a liquid condition making it a simple operation to fill the moulds at low pressure, approximately 2,000 p.s.i. The W700 machine is capable of moulding from 176 to 220 lb. of material an hour depending upon the compound used and a single injection can be any weight up to 3 lb. 5 oz. In view of the low injection pressures employed, moulds can be manufactured from cast aluminium or other suitable light alloys with a consequent reduction in mould cost. It is thus possible, when employing this machine, to produce short runs of low priced articles on an economic basis. The cooling of the moulds is brought about quite simply by the surrounding atmosphere. At present, the mould carriers are closed by hand with the levers provided, thus securely locking the moulds in position. One can imagine however, that this process will be largely automated and thus make completely automatic operation possible. A 13 horse-power motor is used to drive the machine, the screw diameter is 4 in. and the screw length 30 in.

The machine is already in use in the footwear industry and has increased production and lowered cost. There are obviously considerable potentialities for this machine in other industries which would undoubtedly extend its range and scale.

The Ankerwerk machine, shown by **Aldersley Agencies Ltd.** was for a large part of the exhibition in operation, and attracted a large number of visitors. For most of the time it was operating on high impact polystyrene but a display adjacent to the machine showed a wide range of mouldings which had been produced and included an interesting moulding from a polycarbonate material manufactured by the German company Bayer. The Ankerwerk DV10/50 machine was described in some detail in the May issue of *Plastics*, page 164.



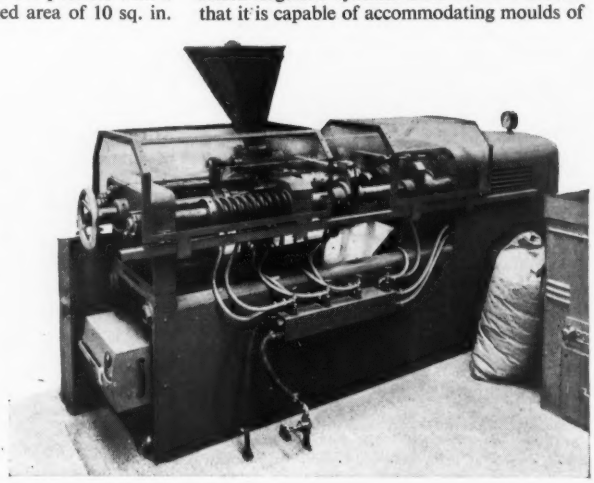
Windsor W.20 injection moulding machine.

The main feature of the Ankerwerk range of injection moulding machines was the employment of a screw acting as a plunger to undertake the necessary plasticization of the material. This technique, which has been widely commented on in the plastics industries of Great Britain, America and the Continent, appears to offer substantial advantages, especially when dealing with some of the more complex materials, such as nylon. It has been pointed out that the injection moulding process as at present practised is unsatisfactory in that it gives rise to a stressed structure with little homogeneity in the mass of the material in the moulded state. It has further been suggested that the substitution of the plunger by a screw overcomes to a large extent these disadvantages giving as a result mouldings of better physical properties than would otherwise be obtainable. Certainly the performance of the Ankerwerk machine appears to substantiate the claims made for this relevatively new technique. A very detailed technical leaflet dealing with this machine has been reproduced in English and was available at the exhibition. The DV10/50 machine is capable of giving up to 600 shots per hour with a capacity of 4.4 oz. using polystyrene, 5.1 oz. using cellulose acetate and 3.9 oz. employing polythene.

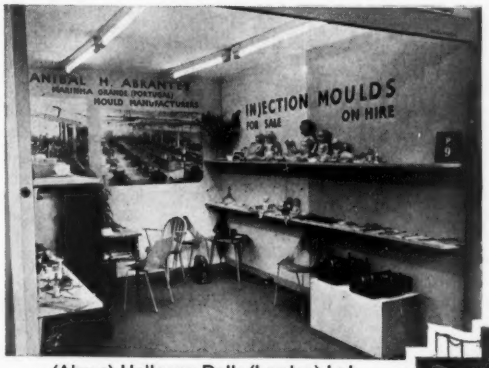
Negri Bossi & Co. of Milan showed two machines, the Rapid O1 and the Rapid R6FA. The first of these machines has a maximum injection capacity per shot of ½ oz. and maximum plasticization capacity per hour of 7.76 lb. Up to 12 shots per minute are possible with a maximum moulded injected area of 10 sq. in. The R6FA machine is a 2 oz. unit, with a maximum injection capacity per shot on double feed of 3 oz. Plasticizing capacity is 29 lb. per hour and the machine will cycle at 8 shots per minute. The maximum moulded projected area is 28–67 sq. in. Both machines were operating and drew great attention from visitors to the exhibition.

The Netstal automatic injection moulding machine was shown by **Grilon and Plastic Machinery Ltd.** of London. This piece of equipment was fully described in the July issue of *Plastics* pages 279/281 in the " Machines for the Industry " series. A brief specification notes that the plasticizing capacity with standard polystyrene is 17/26 lb. per hour, the maximum weight per shot is 3 oz., and the number of injections per hour with standard drive is 300. Up to 600 injections per hour can be obtained with high-speed drive.

A versatile machine, facilitating the production of low cost mouldings in large and small quantities, the **Asmidar** APM21 hand operated bench injection moulding machine attracted considerable interest. It is suitable for working thermo-plastics, acetates, polystyrene, polythene and p.v.c. with a normal cylinder, and will also work with nylon with a special cylinder. Surprisingly high production rates can be obtained with this machine, up to 100 shots per hour. As exhibited at the exhibition, the machine incorporated two totally new features. The first was that the machine is fitted now with new leak-proof self-sealing and interchangeable cylinder units and the second that it is capable of accommodating moulds of

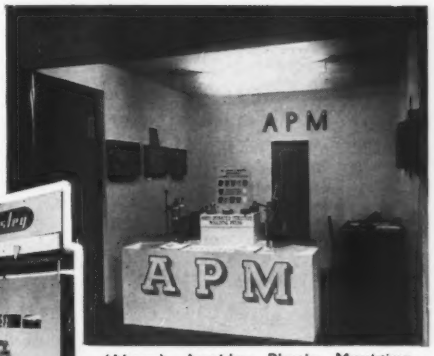


The 30 gram injection machine of Sommer, shown by Industrial Plastics Ltd.

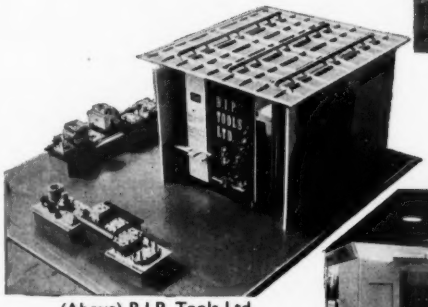


(Above) Holloway Dolls (London) Ltd.

(Below) Aldersley Agencies Ltd.



(Above) Asmidar Plastic Moulding Machines Ltd.



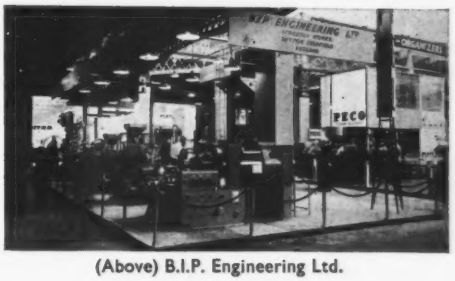
(Above) B.I.P. Tools Ltd.

(Below) Beanwy Electric Ltd.

(Above) Baker Perkins Ltd.

(Above) Boston Marine & General Engineering Co. Ltd.

(Below) Ed. Brand Ltd.

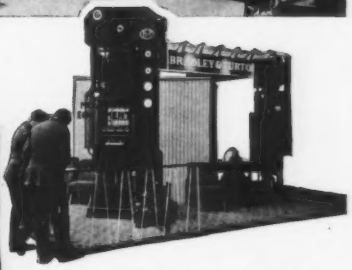


(Above) B.I.P. Engineering Ltd.

(Right) Bone Bros. Ltd.

(Above) B.L.C. (Exports) Ltd.

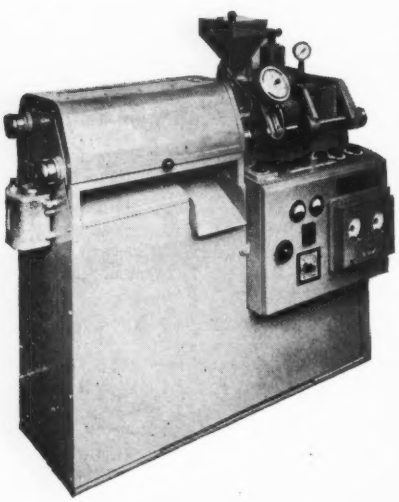
(Below) Burtonwood Engineering Co. Ltd.



(Above) Bradley & Turton Ltd.

varying sizes in a new quick acting cam lock device. ¾ oz. of material can be moulded per shot and the ram diameter is .82 in. As a result of its high performance characteristics, the Asmidar machine is employed for experimental laboratory work, to test prototypes, new designs and modifications, for educational purposes where it is particularly useful for teaching and demonstration purposes, and in the industrial field where it is employed in the plastics industry for colour proving experimental moulding, prototypes, pilot plant production, etc. The machine is also being used in the electrical industry for the manufacture of switch parts, components with metal inserts, etc. in the radio industry for decorative parts and technical components, in the hearing-aid industry for integrally moulded plugs and wires and in medical and dental applications for bone replacements, dental mechanics, orthopædic components, etc. The toy and artificial jewellery industries also employ this machine.

On the stand of **R. H. Windsor Ltd.** demonstrations were being carried out on the new W.20 injection moulding machine. This machine has a moulding shot capacity in polystyrene of 5 oz. and a dry cycle time of 400 shots per hour. It is fitted with a selective variable double shot mechanism which will increase its capacity by 50%. A further feature of its construction is an injection boost coupled with a pressure reduction mechanism both separately timed which give varied combinations of pressure during the injection stroke. The mould height adjustment is accomplished by traversing the whole toggle assembly by means of four tie bar nuts which operate in unison. The W.20 has a toggle clamp pressure of 200 tons and is capable of plasticizing between 50 and 60 lb. of raw material per hour. The largest injection moulding machine shown by this company was the AP120. This machine is fitted with a pre-plasticizing unit and has a clamping pressure of 750 tons. The pressure is exerted through a compression bar direct lock system. The adjustment for the mould height, which is 20 in. takes place by movement of the traverse locking mechanism along the bed by rotating the tie bar nuts by a hydraulic motor and gear box. All the hydraulic valves are gasket mounted and are contained in a manifold block.



Battenfeld B.S.M. injection machine

Westminster hand and power operated and the new Dowding Series II injection moulding machines were exhibited by **Dowding & Doll Ltd.** Two Series II machines (see *Plastics*, March, 1957, 98–101) were demonstrated producing spent razor blade dispensers and pin bowls from Lustrex polystyrene.

The third Series II machine was shown producing nylon bushes. Additional features of this machine included a special thermal seal type nozzle, additional control on the injection pressure, and a timer for withdrawing the plunger at the end of the injection period.

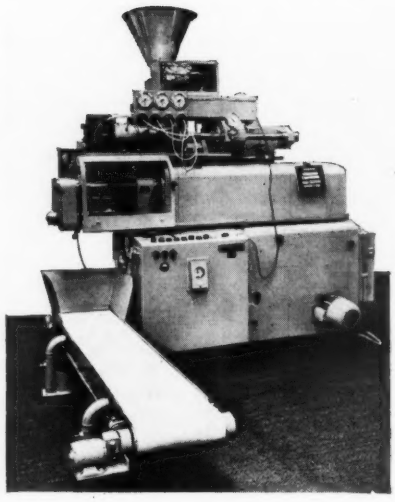
A versatile injection moulding machine, specially constructed to produce small thermoplastics components requiring the use of insert moulding techniques, was shown by **B.L.C. (Exports) Ltd.** This machine has been designed to handle plastics materials for electrical applications, electronics, medical items, for general engineering purposes, for components for automobiles and toys. The machine is an air operated fast-cycling unit, designed after lengthy experience, for the fast moulding of small parts, especially those requiring either moulded inserts or complicated moulds with removable cores. An interesting feature shown in operation was the circular mould table carrying six moulds, rotated between cycles, thus permitting even faster production on insert work.

Three H.P.M. injection moulding machines were shown by **Wickman Ltd.** These were of 12, 20 and 48 oz. shot capacity for normal cycling. Although these machines are of American design they are manufactured in this country by Cravens Ltd. and they have several interesting features. A full description of the 20 oz. machine, with drawings appears on pages 346–47 of this issue, and specifications for the 12 and 48 oz. machines are given.

Two **Triulzi** injection moulding machines were in operation during the exhibition on the stand of Alexander Cardew Ltd. These machines are fully automatic and serve as examples of a range with from 1.7 to 32 oz. shot capacity. A fuller description of their operation was given in the June issue of *Plastics*, together with a complete specification.

The Sommer injection moulding machine was shown by **Industrial Plastics Ltd.** This machine which has a 30 g. shot capacity is fully automatic and has a cycle time of 12 injections per minute. The operation of this machine is unorthodox in that a single movement performs all the operations of the cycle which thus simplifies its manufacture. The movement initially closes the mould, a further movement in the same direction pushes the mould against the injection nozzle and as the movement continues so the whole injection unit is pushed against the fixed injection plunger and injection takes place. On the release of pressure the springs push the cylinder and injection platen to their original position and the mould is opened.

The largest **Battenfeld** machine shown by **Ed. Brand Ltd.** was the 52 oz. machine, but besides this there are many small automatic machines of considerable interest. Two special machines of interest were the B.S.M.100 V., which is a vertical injection moulding machine of 5 oz. shot capacity capable of a 15-seconds cycle time and like all of the Battenfeld machines it is fed with an automatic weigh feed mechanism and is capable of fully automatic operation. The second machine, seen for the first time in this country, was the model B.B.M.60 which has been developed for the fully automatic production of hollow vessels having a material volume of 1 to 4 cu. in. The machine operates by passing the granular material, measured off by means of an automatic dosing scale, through a plasticizing cylinder, similar to that used on injection moulding machines, and leaves the nozzle as a hot plastic tube vertically downwards. The free length of pipe when the mould is closed is about 8 in. The semi-formed product is cut off from the nozzle and transferred into the hollow mould below. While the mould is being closed, the blowing needle swings over and is introduced into the half-finished product which, after the closing of the mould, is blown to shape. During the blowing time, through the agency of an electric process clock, the ejection of a new half-formed tube begins and, depending upon the length of the semi-formed product, air is released from the hollow vessel, the mould opened, and the finished product ejected. The changing of the times of the individual operations can be effected during the running of the machine and it is so designed that changing of the time of a part-operation affects the total time only, without influencing the times of the other part-operations.



Battenfeld bottle plant.

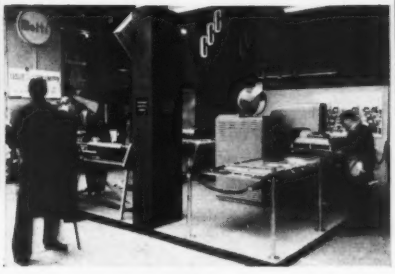
The **Hupfield** automatic injection moulding machines have been fully described in the December, 1956, issue of *Plastics*. A further modification to these machines is a double shot mechanism which increases their capacity to 3 oz. Shown for the first time by this company was a mould temperature control unit operated by controlling the mould cooling water temperature by means of heaters or cooling fans.

Alfred Herbert Ltd. demonstrated two of their injection moulding machines the Herbert-Reed-Prentice 400 T and 175 T. The 400 T machine has a capacity of 16 oz. with a 16-secs. dry-cycle time and a positive mould-locking pressure of 400 tons. Model 175 T has a dry cycle time of 6 secs. with a capacity of 4 to 6 oz. These machines can be fitted with the economical Herbert low-voltage induction heaters which give a rapid warm-up and close temperature control.

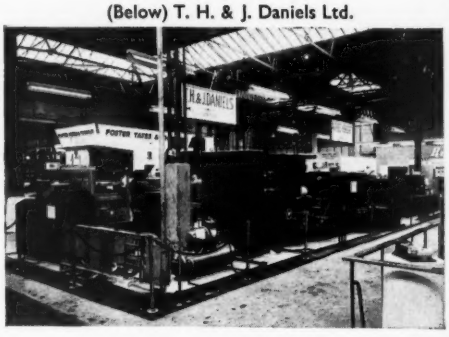
(Right) Coutinho Caro & Co.

(Left) Dowding & Doll Ltd.

(Right) General Engineering Co. (Radcliffe), Ltd.



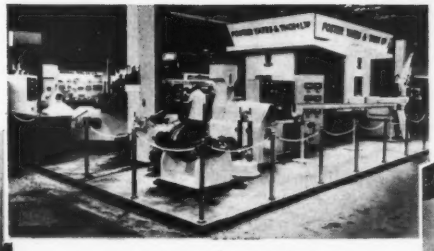
(Below) T. H. & J. Daniels Ltd.



(Left) Engis Ltd.

(Below) British Ermeto Corporation Ltd.

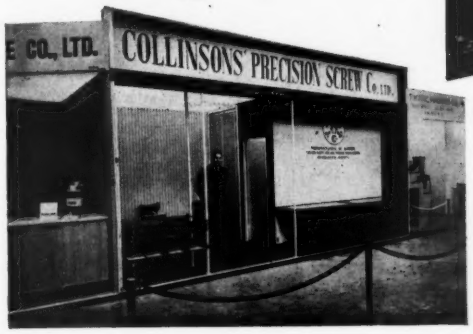
(Below) Fawcett-Finney Ltd.

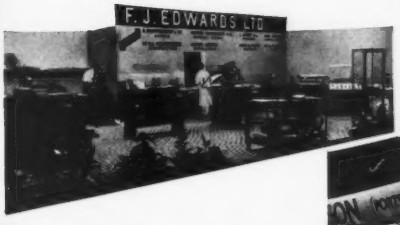


(Above) Foster Yates & Thom Ltd.

(Below) George Ellison Ltd.

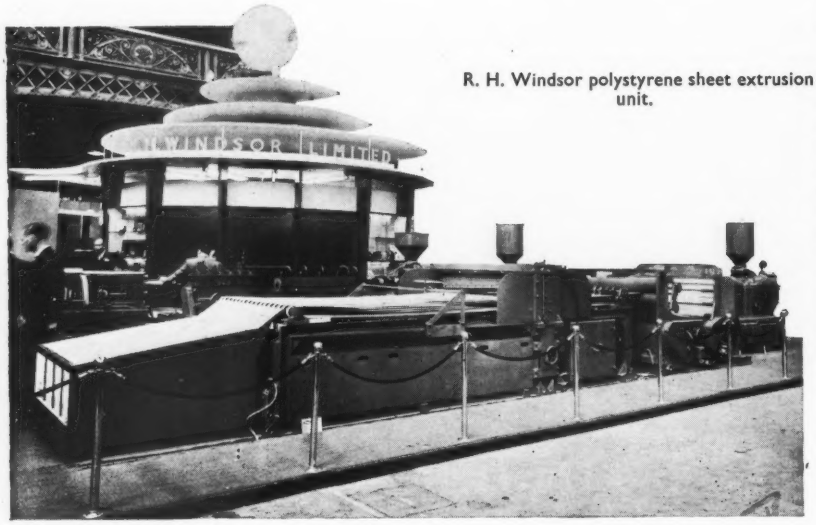
(Below) Collinsons' Precision Screw Co., Ltd.





(Above) F. J. Edwards Ltd.

(Right) J. Evans & Son (Portsmouth) Ltd.



R. H. Windsor polystyrene sheet extrusion unit.

Fast cycling injection moulding machines and machines fitted with In-Line preplasticizing were featured by **The Projectile & Engineering Co., Ltd.**

In-Line preplasticizers are fitted to Peco models 30 MP 40, 20 MP 30 and 50 MP 60, which were shown. Model 50 MP 60 has a shot capacity of 60 oz. with a plasticizing capacity of 200 lb. per hour. The preplasticizer displacement is 50 cu. in. at a pressure of 9,770 p.s.i. The mould locking force is 500 tons and the platen size 36 in. × 42 in., with a mould opening stroke of 16–23 in. A minimum dry cycle time of 25 secs. is given for this machine which was demonstrated moulding bowls from Grade 7 Alkathene. The new 4 oz. model 20 MP 30 fitted with a 70-ton locking unit has a dry cycle time of 7½ secs. and was shown as a static exhibit.

The 30 MP 40, 8 oz. machine was demonstrated producing two end units in polystyrene for an all plastic accordion moulded by Thames Valley Moulders, for Selcol Products Ltd. This moulding is a 9 oz. shot with an area of 95 sq. in.

Fast cycling machines shown were models 10 MS 10, 12 MS 12, 20 MS 20, and 30 MS 30, with capacities of ½, 1, 2½, and 4½–6 oz. respectively. The fully automatic 10 MS 10 machine (see *Plastics*, May, 1957) was shown producing thin wall containers. Model 12 MS 12 was demonstrated producing key tags. It has a dry cycle time of 4.0 secs., and a mould locking pressure of 25 tons. Models 20 MS 20 and 30 MS 30 have minimum dry cycle times of 4 and 6 secs. respectively, and mould locking pressures of 70 and 150 tons. Both machines were run, the former producing parts for a toy musical instrument and the latter producing closures.

Manufactured in a range of capacities, 2, 3, 5, 7 and 10 oz., the **Albert Stübbe** injection machines were demonstrated. All types are available in four models, including hand-operated and fully automatic machines. The model H.200M.E. machine has a maximum projected area of moulding of 90 sq. in., and a plasticizing capacity of 33 to 42 lb. per hour, depending upon the material used. The machine was shown in operation on the stand of **F. J. Edwards Ltd.** who are the agents for this machine.

Extruders

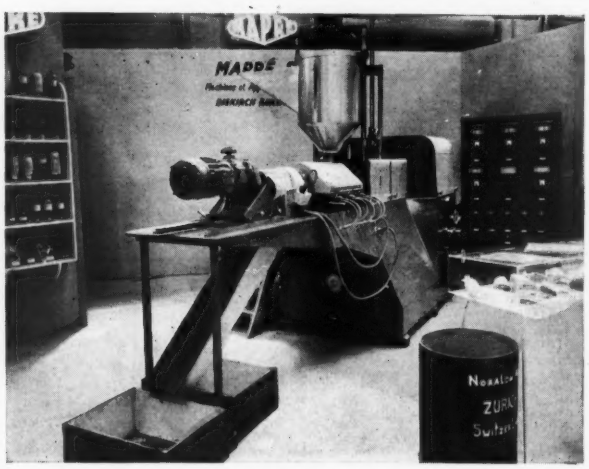
FEATURED on the stand of **Fawcett Finney Ltd.** was the Davis Standard 4½ in. thermoplastic extrusion machine. A brief specification of this machine will be of interest; it has a rated capacity of 400 lb. per hour with p.v.c. and 300 lb. per hour with polythene at 90 r.p.m. screw speed. The effective screw length of the standard machine is 60 in. and the heating capacity is as follows: four heating zones, head zone 2,000 watts, three cylinder zones of 7,000 watts each. The barrel cooling of the machine incorporates separate blowers for each zone, blower capacity constituting 1,100 cu. ft. per minute each. A feature of the Fawcett Finney equipment associated with this machine is the take-off gear such as the 24 in./40 in., dual reel take-up design for automatic operation and change over for handling domestic wiring. Constant wire tension adjustable from 5 to 40 lb. is obtainable. A dual capstan, 32 and 48 in. diameter, is also available in the Davis Standard range of equipment. Extremely flexible speed control is obtained by the use of variable speed drives and four speed gearboxes. One or both drums can be driven and either can be tilted to prevent rubbing of the wire as the drum grooves are always in line (see *Plastics*, June, 1956).

Mapré S.A., the Luxemburg company, exhibited the twin-screw extruder type E25492, a machine suitable for the extrusion of almost all types of thermoplastic materials. A special feature of this machine, is that it produces gradual and simultaneous mixing and kneading, softening and extruding powders, and delivers a finished product without preliminary treatment. The diameter of the screws is 92 millimetres, rotation being reversible, the screws near the die-head floating and near the drive articulated. The speed of rotation of the screws is continuously variable from 8 to 36 r.p.m. A complete specification of the machine is available from the company.

A feature on the stand of **Baker Perkins Ltd.** were two extrusion machines, specially designed to meet the exacting needs of the rapidly expanding plastics industry. They are built to the same high standard of design materials and workmanship as characterize the universal mixing machines for which the company has for so long been well known. The two models, the 35 and the 15/20, are of very robust appearance. The 35 has a screw diameter of 3½ in. and the 15/20 machines are available in 1½ or 2 in. screw diameters. The latter machines have been primarily designed as laboratory units but may well be used for modest outputs of equally high quality work. A brief description of the model 35 machine will be of interest. It is a single screw machine, the screw having a length diameter ratio of 15 to 1, the motor horse power being 50.

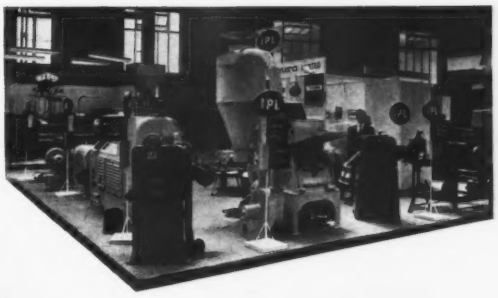
The control panel is a separate unit which may be installed in any position relative to the extruder and the panel houses six semi-proportional type temperature controllers motor starter gear, a motor ammeter, fuses and on/off switches, and indicator lamps for the barrel heating. Trial reports of the machine indicate that the output is extremely high and the model 35 machine is obviously an important addition to the range of extrusion equipment manufactured in Great Britain.

R. H. Windsor Ltd. showed two new extrusion machines. These were the 3½ in. and 4½ in. single screw extruders. They contain several notable features, including a

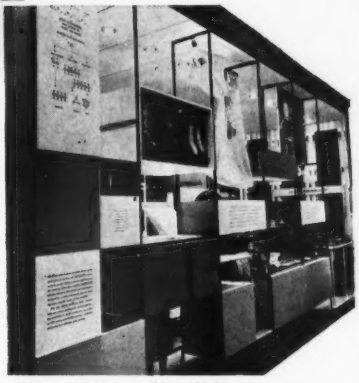


Twin screw extruder shown by Mapré S.A.

(Left) John Kimbell & Co., Ltd.
(Right) Industrial Plastics Ltd.

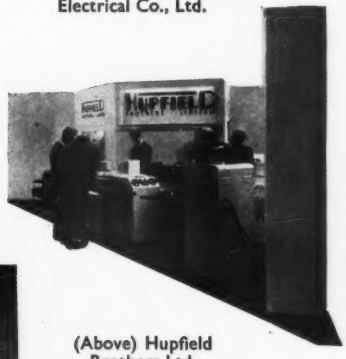


(Below) Metropolitan Plastics Ltd.



(Above) Metropolitan-Vickers Electrical Co., Ltd.

(Above) W. F. Johnson & Co. (London) Ltd.



(Above) Hupfield Brothers Ltd.

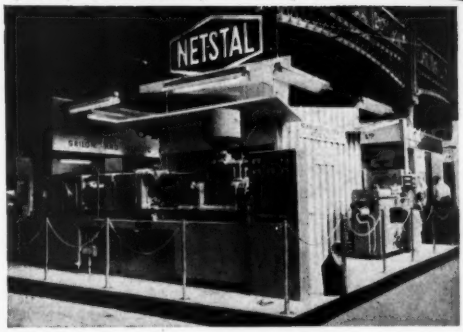
(Above) Guest Keen & Nettlefolds (Midlands) Ltd.

(Below) London & Scandinavian Metallurgical Co., Ltd.

(Above) The Granbull Tool Co., Ltd.

(Above) Kemitype Ltd.

(Below) Machine Factory & Foundry Ltd.



(Below) Mapré, S.A.

R. H. Windsor polystyrene sheet extrusion unit.

Fast cycling injection moulding machines and machines fitted with In-Line preplasticizing were featured by **The Projectile & Engineering Co., Ltd.**

In-Line preplasticizers are fitted to Peco models 30 MP 40, 20 MP 30 and 50 MP 60, which were shown. Model 50 MP 60 has a shot capacity of 60 oz. with a plasticizing capacity of 200 lb. per hour. The preplasticizer displacement is 50 cu. in. at a pressure of 9,770 p.s.i. The mould locking force is 500 tons and the platen size 36 in. × 42 in., with a mould opening stroke of 16–23 in. A minimum dry cycle time of 25 secs. is given for this machine which was demonstrated moulding bowls from Grade 7 Alkathene. The new 4 oz. model 20 MP 30 fitted with a 70-ton locking unit has a dry cycle time of 7½ secs. and was shown as a static exhibit.

The 30 MP 40, 8 oz. machine was demonstrated producing two end units in polystyrene for an all plastic accordion moulded by Thames Valley Moulders, for Selcol Products Ltd. This moulding is a 9 oz. shot with an area of 95 sq. in.

Fast cycling machines shown were models 10 MS 10, 12 MS 12, 20 MS 20, and 30 MS 30, with capacities of ½, 1, 2½, and 4½–6 oz. respectively. The fully automatic 10 MS 10 machine (see *Plastics*, May, 1957) was shown producing thin wall containers. Model 12 MS 12 was demonstrated producing key tags. It has a dry cycle time of 4.0 secs., and a mould locking pressure of 25 tons. Models 20 MS 20 and 30 MS 30 have minimum dry cycle times of 4 and 6 secs. respectively, and mould locking pressures of 70 and 150 tons. Both machines were run, the former producing parts for a toy musical instrument and the latter producing closures.

Manufactured in a range of capacities, 2, 3, 5, 7 and 10 oz., the **Albert Stübbe** injection machines were demonstrated. All types are available in four models, including hand-operated and fully automatic machines. The model H.200M.E. machine has a maximum projected area of moulding of 90 sq. in., and a plasticizing capacity of 33 to 42 lb. per hour, depending upon the material used. The machine was shown in operation on the stand of **F. J. Edwards Ltd.** who are the agents for this machine.

Extruders

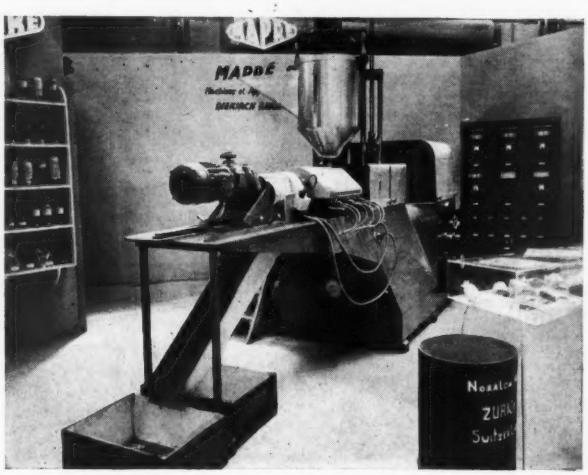
FEATURED on the stand of **Fawcett Finney Ltd.** was the Davis Standard 4½ in. thermoplastic extrusion machine. A brief specification of this machine will be of interest; it has a rated capacity of 400 lb. per hour with p.v.c. and 300 lb. per hour with polythene at 90 r.p.m. screw speed. The effective screw length of the standard machine is 60 in. and the heating capacity is as follows: four heating zones, head zone 2,000 watts, three cylinder zones of 7,000 watts each. The barrel cooling of the machine incorporates separate blowers for each zone, blower capacity constituting 1,100 cu. ft. per minute each. A feature of the Fawcett Finney equipment associated with this machine is the take-off gear such as the 24 in./40 in. dual reel take-up design for automatic operation and change over for handling domestic wiring. Constant wire tension adjustable from 5 to 40 lb. is obtainable. A dual capstan, 32 and 48 in. diameter, is also available in the Davis Standard range of equipment. Extremely flexible speed control is obtained by the use of variable speed drives and four speed gearboxes. One or both drums can be driven and either can be tilted to prevent rubbing of the wire as the drum grooves are always in line (see *Plastics*, June, 1956).

Mapré S.A., the Luxemburg company, exhibited the twin-screw extruder type E25492, a machine suitable for the extrusion of almost all types of thermoplastic materials. A special feature of this machine, is that it produces gradual and simultaneous mixing and kneading, softening and extruding powders, and delivers a finished product without preliminary treatment. The diameter of the screws is 92 millimetres, rotation being reversible, the screws near the die-head floating and near the drive articulated. The speed of rotation of the screws is continuously variable from 8 to 36 r.p.m. A complete specification of the machine is available from the company.

A feature on the stand of **Baker Perkins Ltd.** were two extrusion machines, specially designed to meet the exacting needs of the rapidly expanding plastics industry. They are built to the same high standard of design materials and workmanship as characterize the universal mixing machines for which the company has for so long been well known. The two models, the 35 and the 15/20, are of very robust appearance. The 35 has a screw diameter of 3½ in. and the 15/20 machines are available in 1½ or 2 in. screw diameters. The latter machines have been primarily designed as laboratory units but may well be used for modest outputs of equally high quality work. A brief description of the model 35 machine will be of interest. It is a single screw machine, the screw having a length diameter ratio of 15 to 1, the motor horse power being 50.

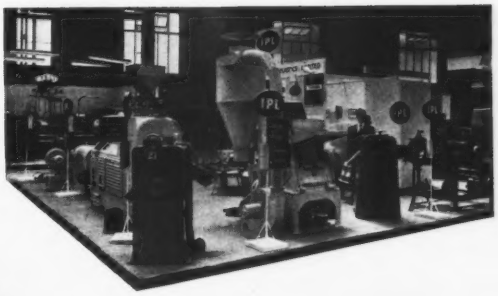
The control panel is a separate unit which may be installed in any position relative to the extruder and the panel houses six semi-proportional type temperature controllers motor starter gear, a motor ammeter, fuses and on/off switches, and indicator lamps for the barrel heating. Trial reports of the machine indicate that the output is extremely high and the model 35 machine is obviously an important addition to the range of extrusion equipment manufactured in Great Britain.

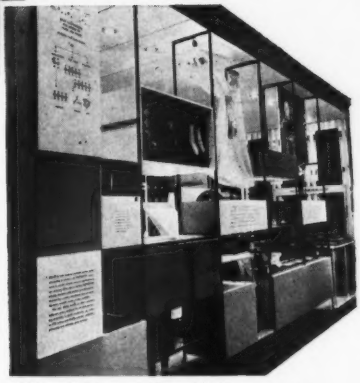
R. H. Windsor Ltd. showed two new extrusion machines. These were the 3½ in. and 4½ in. single screw extruders. They contain several notable features, including a



Twin screw extruder shown by Mapré S.A.

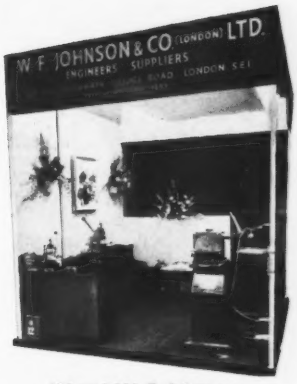
(Left) John Kimbell & Co., Ltd.
(Right) Industrial Plastics Ltd.



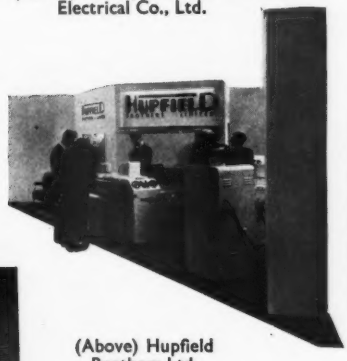


(Above) Metropolitan-Vickers Electrical Co., Ltd.

(Below) Metropolitan Plastics Ltd.



(Above) W. F. Johnson & Co. (London) Ltd.



(Above) Hupfield Brothers Ltd.

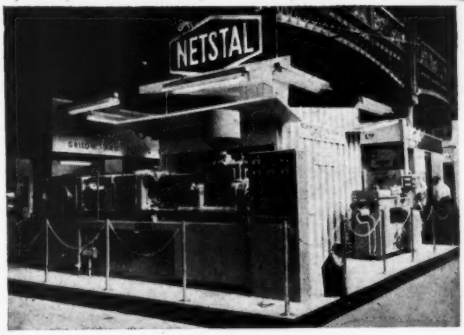
(Above) Guest Keen & Nettlefolds (Midlands) Ltd.

(Below) London & Scandinavian Metallurgical Co., Ltd.

(Above) The Granbull Tool Co., Ltd.

(Above) Kemitype Ltd.

(Below) Machine Factory & Foundry Ltd.



(Below) Mapré, S.A.

Wire covering plant shown by Foster Yates & Thom Ltd.

hydraulic variable drive with controlled torque, independent zone controlled cooling on the barrel by means of air and barrel heating by induction heaters. Both machines have a 20 to 1 length to diameter screw ratio and screw speeds are infinitely variable on the 3½ in. between 10 and 90 revs. per minute and on the 4½ in. between 10 and 80 revs. per minute. The output of the latter is up to 400 lb. per hour dependent on the material and die construction and on the 3½ in. machine it is 250 lb. per hour. In conjunction with these extruders several haul-off and take-off equipment was shown, particular interest being attached to the sheeting equipment. This consists of three basic parts, the sheeting die, the take-off unit and the conveyor and guillotine assembly. The sheeting die has been designed specifically for the production of high-impact polystyrene sheet and is housed in a pressure plate so as to reduce any tendency for expansion under internal pressure. The take-off unit has three hard chrome-faced rollers, of which the sizing roller is pneumatically operated and it is adjustable for sheet thickness. Two accurately machined rubber-covered pinch rolls control the speed of the sheet through the take-off. The speed of the take-off is infinitely variable with independent or combined control on both sets of rollers. The conveyor and guillotine assembly is two conveyors and pneumatically operated guillotine. The sheet length is determined by a photo electric cell arrangement.

The whole assembly has accurate heating control and speed control to give a maximum output conducive with the type of sheet being produced.

A 1½ in. and a 3½ in. extruder for wire covering were exhibited by **General Engineering Co. (Radcliffe) Ltd.** Both these machines are of similar design, being driven from an electric motor through a worm reduction gear. The barrels are one-piece alloy steel forgings extending through the feed box casting, and located with key and clamp. Polythene and p.v.c. screws are available for use with both machines, the former having a 15:1 L/D ratio, constant pitch, diminishing depth single start thread with a shallow metering section at the delivery end. The latter is a constant pitch, two start diminishing depth thread and has a 15:1 L/D ratio.T he 1½ in. has a plasticizing capacity on flexible grade p.v.c. of 30/35 lb. per hour.

The ancillary equipment shown with these extruders included an automatic reeling and coiling machine and cable testing, marking and cutting machinery.

The former machine is available in two sizes but both of the same basic design. The drive is taken from a 2 h.p. 3-phase induction motor through a 4:1 variable speed drive of the expanding pulley type, and thence via a vee-belt drive to the reel shaft. An adjustable air reversed traverse is incorporated so that the wire lay is steplessly variable over a 7:1 diameter range. The traverse is also steplessly adjustable within its range as regards width of coils. For braking purposes the machine is fitted with a pneumatic disc brake capable of exerting 200 lb. ft. torque at an air pressure of 100 p.s.i. This brake can be interlocked in the control system so that the machine will stop immediately a fault is found in the cable, or when the preset length of wire is wound on to the reel or coil.

The marking machine operates on the gravure principle and will operate at speeds up to 100 ft. per minute. The printing wheels are produced by a photographic etching process which permits accurate reproduction of detail in small legends, trade marks and the like and after etching the wheels are hard chrome plated to prevent wear and preserve the high grade surface finish.

The printing wheel is mounted on a stainless steel spindle carried in ball and V-groove bearings adjustable for pressure. The periphery of the wheel is wiped by a spring steel doctor blade carried in a floating doctor assembly located by the wheel itself and supported by the ink bath. The ink bath has sufficient ink capacity for at least four hours' running, in addition a continuous ink feed device is provided. A metering screw is provided to control the rate of ink flow. Handwheel adjustments are incorporated for setting the machine height in relation to the wire line, adjusting the material guide rollers, centering the printing and swinging the machine clear of the material line.

The extrusion of layflat tubing with a Peco model 25 Extruder aroused much interest on **The Projectile & Engineering Co., Ltd.,** stand. This 2½ in. extruder was operating in conjunction with a vertical blown film take-off unit which will accept film up to 30 in. wide. Model 25 has a fully flighted 4:1 compression ratio screw with a L/D ratio of 16:1. Model 45, a 4½ in. extruder complete with a 12 in. trolley pipe take-off unit, and the new Peco model 15 1½ in. extruder complete with water bath and nip roller take-off unit, were shown as static exhibits.

Francis Shaw & Co., Ltd., exhibited their P4½ in. plastic extruder with a lay-flat tubing head. The screw and cylinder are machined from solid nitralloy forgings and the screw is bored for internal cooling. Zone heating to the cylinder is provided by electric elements, carried on sleeves with labyrinth construction allowing for cooling. The extruder is driven by a 50 h.p. squirrel cage motor through a Dynamatic slip coupling giving a constant speed output characteristic, the screw speed is infinitely variable up to about 100 r.p.m. and is indicated by a tachometer mounted on the instrument panel. Gearings and bearings are automatically lubricated. The lay-flat tubing die is fitted with annular cooling rings. Models of the famous Shaw Intermix and Rotocure were on view.

The Italian **Pasquetti** twin screw compounder extruder (Type CP 2VO) was exhibited by **T. H. & J. Daniels Ltd.** This machine, the smallest of the Pasquetti range, has two 1⅞ in. screws driven by a 1.6 h.p. motor through a V-belt drive. The barrel is electrically heated and the extruder has a nominal capacity of up to 40 lb. per hour dependent on the material worked.

Shown for the first time at the exhibition by **Boston Marine & General Engineering Co., Ltd.,** was the Boston Universal Take-Off. This machine has been designed to provide strong but gentle pull on extruded pipe and rod. Two adjustable conveyors fitted with special rubber pads provide a positive grip on the extruded products. Both conveyors are driven by a variable speed control which can be linked to the extruder so that any variation in extrusion speed is automatically taken up by the take-off equipment. Closely spaced roller bearings support the two conveyor belts along their full length and lateral guide rollers are also fitted. A feature of this machine besides its easy setting is the facility with which different types of belts may be fitted.

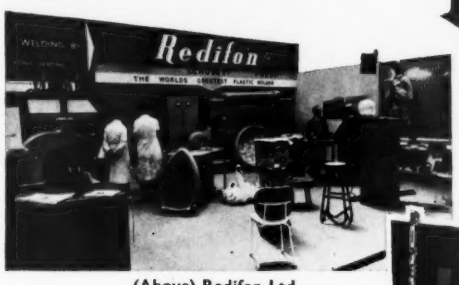
The extrusion equipment shown by **W. S. Electronics (Extruder) Ltd.** is notable for its light weight and the use of standard components in its manufacture. This latter point is of particular importance in that it simplifies the obtaining of spare parts.

The extruder shown was the redesigned 2 in. Precision extruder in which the control cabinet is now incorporated in the extruder casing itself. This machine has a plasticizing capacity of 90 lb. per hour and is driven by a 10 h.p. motor through a four-change gear box and thence by a triplex chain drive to the extruder's screw. The barrel is machined in three sections from heat-treated steel and has fitted a water cooling jacket and is divided into three heating zones. The screw has a L/D ratio of 18:1 and three types are available. These are a three-start shallow buttress thread constant pitch, constant depth for p.v.c., a three-start constant pitch decreasing depth screw for polythene and a single start screw for nylon.

(Above) Francis Shaw & Co., Ltd.

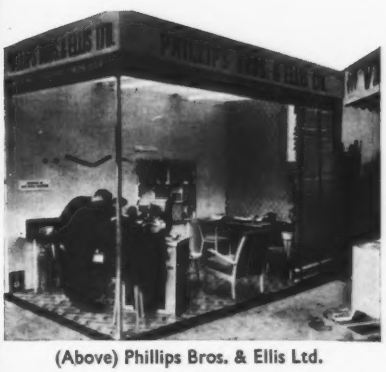
(Above) Plastic Tool Co., Ltd.

(Above) Mullard Ltd.

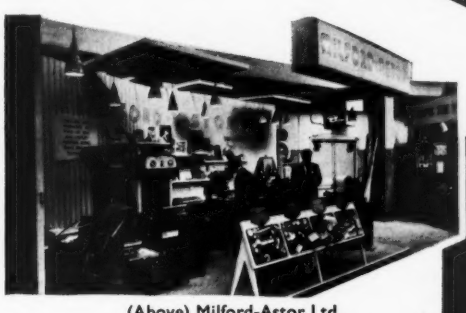


(Above) Redifon Ltd.

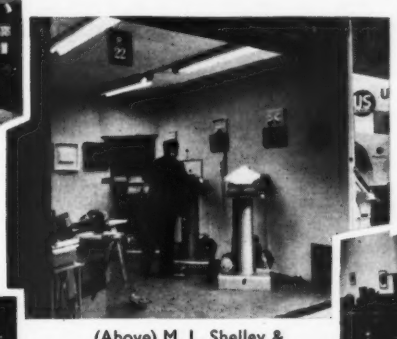
(Above) Projectile and Engineering Co., Ltd.



(Above) Phillips Bros. & Ellis Ltd.



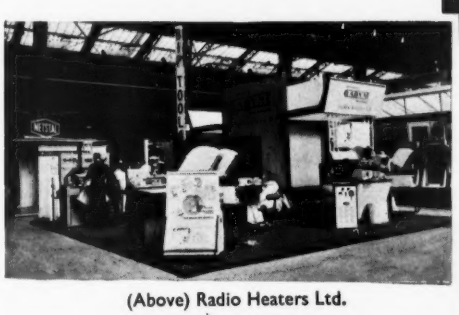
(Above) Milford-Astor Ltd.



(Above) M. L. Shelley & Partners Ltd.

(Above) H. Schubert Ltd.

(Below) J. Sandt A.G.



(Above) Radio Heaters Ltd.

(Below) Negri Bossi & Co., Arger (Machinery) Ltd.

(Above) Sheridan Croxted Ltd.

The take-off equipment shown included a capstan haul-off driven by a ½ h.p. motor, a water cooling bath and a belt haul-off which is also driven by a ½ h.p. motor.

Also shown by this company was the 1 in. extruder which is driven by a 3 h.p. motor through a 3 speed gear box and has a plasticizing capacity of 40 lb. per hour.

The main interest in the stand of **Bone Bros. Ltd.** was a 2½ in. extruder used in conjunction with their latest take-off equipment, for the production of polythene tube. The extruders themselves are manufactured in this country under licence from Frank W. Egan & Co. of America. A new vapour cooling system has been fitted to the extruder known as the Willert system. This is a closed water recirculating condenser system which is brought into operation by the temperature controllers. The extruder is very similar to the one used for paper coating which was fully described in the March/April/May, 1956, issue of *Plastics*.

Besides the 2½ in. extruder a 1½ in. laboratory model and a 4½ in. machine were shown. Various dies for paper coating film, tube, and wire covering were also displayed.

The **Burtonwood Engineering Co., Ltd.,** were exhibiting the Andouart extruder and take-off equipment for wire covering. This equipment was fully described in an article appearing in *Plastics*, April, 1957. Besides the wire covering take-off, a caterpillar traction unit for tube haul-off was exhibited. All the plant shown was manufactured in this country.

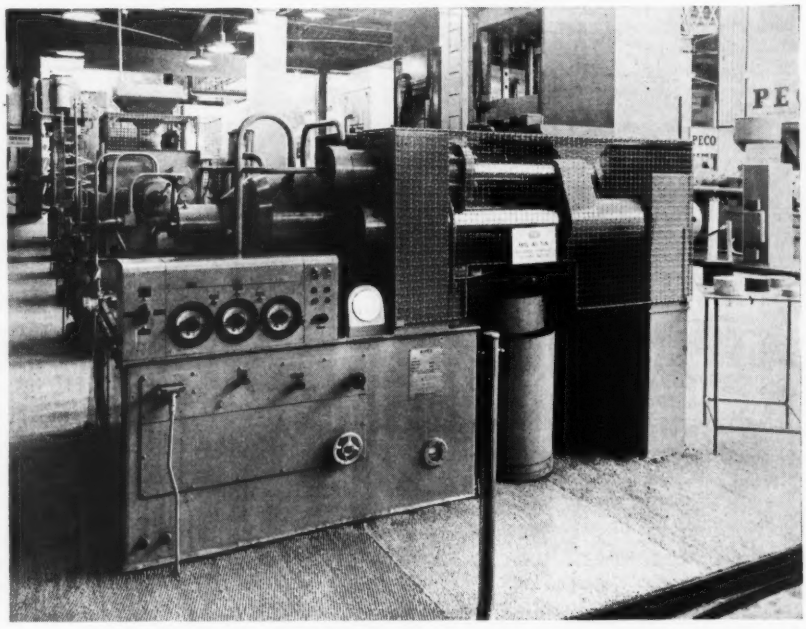
The 3½ in. Bandera extruder was shown by **Industrial Plastics Ltd.,** as a compounding machine with air cooling take-off, granulating and screening equipment. The extruder is powered by a 16 h.p. motor driving by vee belts a gear box or speed variator. The barrel is cast iron and fitted with a chrome nickel steel liners and has three heating zones. Various types of screw can be fitted according to the type of material being processed.

Different extruder dies for this machine were also exhibited including a die for the production of p.v.c. lay-flat tubing.

The complete plant for sheet extrusion and lamination using the 90 R.G.V. 3½ in. **Reifenhauser** extruder was prominently displayed by **Ed. Brand Ltd.** This plant will produce sheet up to approximately 39 in. wide. The 90 R.G.V. extruder is normally powered by a 30 h.p. motor and is fitted with a forged steel cylinder so designed as to allow of a perfectly coaxial fitting of the screw into the roller thrust bearing. The screws have, generally, a 15 : 1 L/D ratio and are highly ground and polished. A smaller extruder with 2¼ in. screw diameter was also shown as well as a specially designed machine, the S.45D., which has two speed ranges for the extrusion of Hostaflon low pressure polythene. Besides the extruders various dies and haul-off equipment were shown.

Vacuum Forming

Vacuum forming equipment manufactured by **Alfred Schwalbach K.G.,** of Germany, was shown by **F. J. Edwards Ltd.** This equipment finds wide application in packaging and other industries.



Horizontal hydraulic pelleting machine shown by B.I.P. Engineering Ltd.

John Kimbell & Co., Ltd., showed two vacuum forming machines manufactured by **Hydro-Chemie Ltd.,** Zurich. Demonstrations were given on the Formvac U-5 automatic Thermoforming machine (see *Plastics*, July, 1957, 285) of the production of a deep drawn vessel with a partition using the plug-assisted Dropform technique. The Formpack R–7 Automatic Rotary high-speed vacuum forming machine and a new Formvac sheet tester were other Hydro-Chemie exhibits. The Formpack R–7 was designed for the high-speed production of packaging products, it has a forming area of 10 × 12 in. and a full production speed of 20 shots per minute with roll feed.

T. H. & J. Daniels Ltd. showed the Daniels/Latymer Junior Automatic Vacuum forming machine with a roller feed. Sheets of 18 × 22 in. can be formed and control can be semi-automatic or completely manual.

Vacuum forming equipment and electronic welding equipment were shown by **Société de L'Électronique Française** of France. The two types of equipment are manufactured by the same company as a joint service to industry. This is particularly valuable in the packaging field where vacuum formed packs require subsequently to undergo welding processes. The equipment is manufactured by the company for the production of leather goods, clothing, inflatable toys, packaging media, cars, upholstery, and other items.

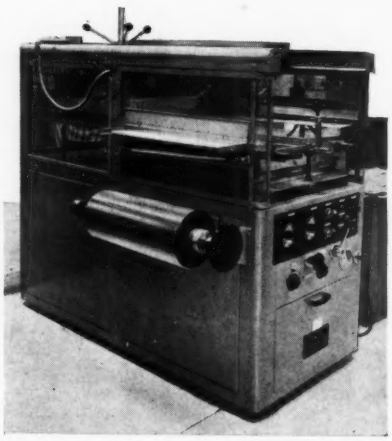
Shown by **Ed. Brand Ltd.** and manufactured by **Vogt & Hartmann,** the clean appearance of the Plastiplast vacuum forming machine was attracting considerable attention. This machine, the 850 P., has a forming area of 33½ in. × 33½ in. and is capable of a depth of draw of 17 in.

Piccolo S is a smaller machine having a forming area of 21 in. × 16 in. and a depth of draw of 10 in.

The modified versions of the Shelley vacuum forming machine were shown by **M. L. Shelley & Partners Ltd.** Separate attachments fitted to this machine enable it to be used for drape and plug assisted forming and these were being demonstrated. A full description of the machine appeared in the April, 1957, issue of *Plastics*. Also on the stand were the polythene bag making machinery exhibited by **Plastic Service.** This machinery is automatic in operation and included in the range is a sealing machine for filled bags.

Moulds and Dies

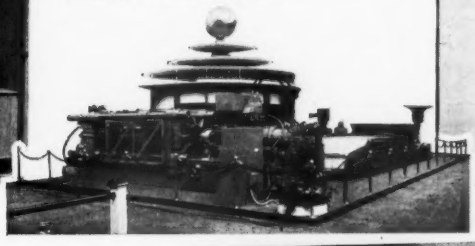
SEVERAL injection moulds made by the **Plastic Tool Co. Ltd.** were shown on their stand. These were made in the nickel chrome



Daniels/Latymer Junior automatic vacuum forming machine with a roller feed.

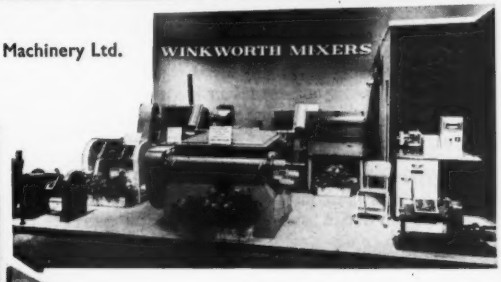
(Left) The Small Power Machine Co., Ltd.

(Below) R. H. Windsor Ltd.

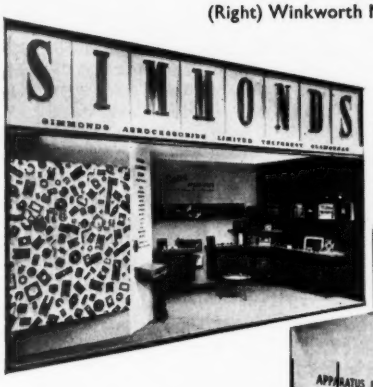


(Above) Talbot Tool Co., Ltd.

(Right) Winkworth Machinery Ltd.



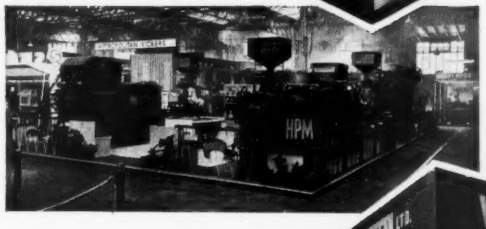
(Right) Tilghman's Ltd.

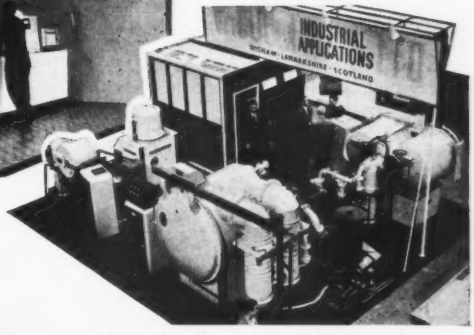


(Above) Simmonds Aeroces-sories Ltd.

(Right) The Tintometer Ltd.

(Left) West Instruments Ltd.

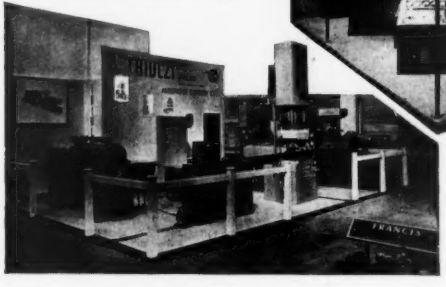




(Above) Vacuum Industrial Applications Ltd.

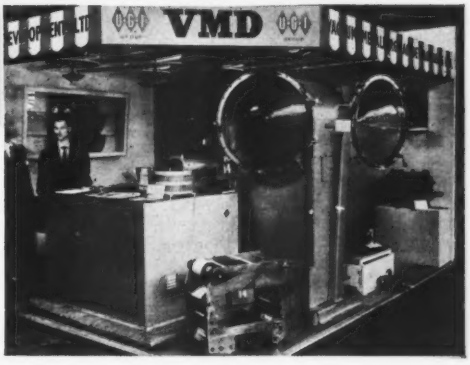
(Above) Wickman Ltd.

(Below) A. Triulzi, Alexander Cardew Ltd.



(Above) W. S. Electronics (Extruders) Ltd.

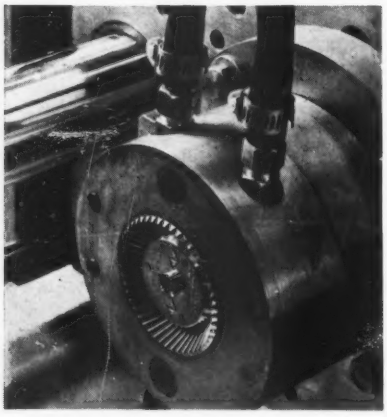
(Right) Vacuum Metallurgical Developments Ltd.



molybdenum type of steel which has been specially developed for the manufacture of such moulds for the plastics industry. It has excellent non-abrasive properties and owing to its great density it is easy to obtain a mirror finish. Several hobbed cavities were also shown, the steel used in these being of Swedish make by Uddeholms.

Attracting a considerable amount of interest was a new automatic bottle-blowing mould developed by the **Granbull Tool Co., Ltd.** and shown for the first time at this exhibition. This tool which fits into a standard injection moulding machine consists of a central mould flanked on each side by the two forming dies. On mould closing a tube is injected round centre core pins which when the mould opens on completion of the injection cycle are transferred to one of the forming dies. The second injection shot on to a second set of cores operates the compressed air blowing mechanism which blows the still plastic tubes out to the walls of the forming dies. The opening of the mould on the completion of the second injection cycle brings the formed bottles back to the centre where they are ejected. Production speeds on this tool are reported at eight bottles per minute which is twice the speed obtained on the hand operated tools which were also being shown.

Installed on a Windsor machine, **London & Scandinavian Metallurgical Co., Ltd.**, were demonstrating an electro-formed hard nickel mould, in this case a helical bevel gear die. The trade mark of the company is embossed in the die by engraving the master from which the mould was manufactured. Electro-forming brings many important advantages to the manufacturer of moulds, one of these being that moulds that are impracticable to make by conventional means are often very simple to produce by electro-forming. Another advantage is cost, in that certain moulds that are technically feasible by conventional mould making methods are frequently made much more economically by electro-forming. Electro-formed dies are being successfully applied with injection moulding of thermoplastics, runs as long as those in similar steel made moulds being easily obtained. They are also employed for the slush casting of p.v.c., for the manufacture of acrylic teeth by compression moulding, for pressure die casting metals and compression and transfer moulding of thermo-setting materials. Lastly, important developments are now taking place in the moulds for blow moulding of polythene bottles.



The electro-formed die which was in use on the London & Scandinavian Metallurgical Co., Ltd. stand.

A range of finished moulds for thermoplastic and thermosetting materials was shown by **B.I.P. Tools Ltd.** This has been one of the most prominent companies in the tool making field and has been responsible for the manufacture of a very large number of important tools. Amongst the special services offered by the company are cold hobbing, induction heating, thread grinding, etc.

Pelleting and Dicing

THE 35-ton multi-punch horizontal hydraulic pelleting machine, shown by **B.I.P. Engineering Ltd.**, attracted considerable attention. This machine, dealing with pellets up to ¾ in. in diameter, extends the use of the horizontal multi-punch machine into fields previously covered only by rotary machines. All controls such as the ability to dwell at the thick filling pressure and ejection position, the accurate control of pressure applied, and weight adjustment have been retained but by reducing the maximum size of pellet that can be produced and fitting a multi-head. The rate of production possible is up to 25,000 pellets per hour.

A **Tavannes** automatic tabletting machine for use in conjunction with Tavannes automatic presses with tablet feeds was shown by **John Kimbell & Co., Ltd.** This machine has a maximum output of 9,600 tablets per hour with a quadruple cavity die, and a maximum pressure of 10 metric tons.

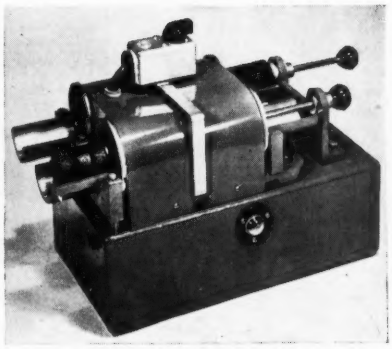
The **Girovinyle** cube dicer and pelletizer were shown on the stand of **Industrial Plastics Ltd.** The dicer will cut cubes from ⅛ in. upwards and is available in a range of eight standard sizes with capacities varying from 100 to 7,000 lb. per hour. The pelletizer will take up to 50 strands simultaneously at speeds of from 15 to 120 ft. per minute.

This company were also showing the **Condux** lump cutting mill which will handle the majority of plastics scrap material. For pelleting extruded strand material the **Previero** strand dicer was shown. This is available in two sizes with blade widths of 200 mm. and 300 mm. respectively.

The Burtonwood–Cumberland dicer was shown by **Burtonwood Engineering Co., Ltd.** This machine which produces accurate cubes by a stair-step method was fully described in the March issue of *Plastics*. Other granulating machinery was also shown by this company.

Pre-heaters

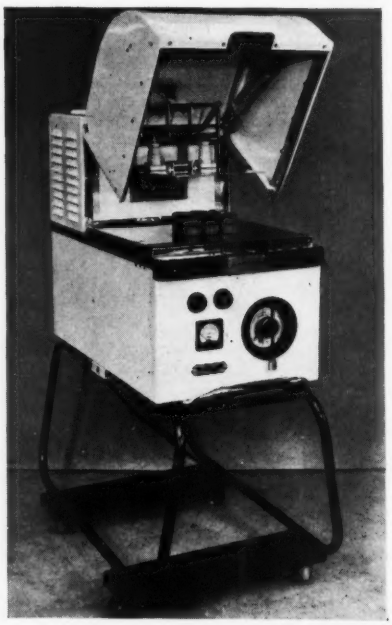
IT is claimed by **Radio Heaters Ltd.** that their new Radyne high speed, high temperature preheaters when used with fast cycling presses can double or treble production, obtained with existing preheaters. Experiments carried out on the T. H. & J. Daniels' stand at the Exhibition using the high speed Daniels' 20-ton Alkyd press enables full pressure to be applied to the mould within five seconds of the preheater cutting off. Ash trays were moulded in black



The Beanwy induction pre-heater shown at the exhibition for the first time.

phenolic materials Bakelite X20 and BRP1050 without preheating the cure time was 2½ mins. at the normal temperature. The cure time was reduced to 1½ mins. with normal preheating to 110° C. in 30 secs. Further reduction in the cure time to 15 secs. was achieved by raising the mould temperature to 375° F. and preheating to 140° C. in 7 secs. with a new Radyne 5 kW. preheater. These new Radyne preheaters are available with power outputs of from 1 to 28 kW. and can preheat to 300° F. in 10 secs. from 0.70 to 1½ lb. of material.

Redifon Dielectric Heaters, types RM32, RM51 and RM54 were exhibited by **Redifon Ltd.** Type RM32 as an approximate output of 1½ kW. and will plasticize up to 16 oz. of G.P. moulding powder performs per minute. The operation frequency of type RM51 is 35 mc/s. It has an output of 2.5–3.0 kW. and can raise 1¾ lb. of phenolic type x 20 preforms to 100 in 1 minute. Type RH54 has an output of 6 kW. and can preheat to 100° C. 3 lb. 14 oz. of phenolic preforms per minute.



The Radyne 5 kW. pre-heater shown by Radio Heaters Ltd.

Infra-red heating was featured by **The General Electric Co., Ltd.** This included a normal infra-red oven as well as an example of its use as a setting plant on a stenter for use with nylon fabrics.

Mixing and Compounding

BUSS continuous working Ko-Kneader was exhibited by **Aldersley Agencies Ltd.** This machine, which provides a continuous mixing action by means of a specially designed worm which allows fixed teeth inside the barrel to pass between the flights when it revolves and reciprocates. This machine was fully described in the November, 1954, issue of *Plastics*. Attached to the Ko-Kneader was an extruding compounder which received the material from the granulator attached to the Ko-Kneader die plant and evening out the pulsating supply extrudes the raw material in sheet or rod form for subsequent dicing. This latter machine can be put under vacuum for the removal of moisture or volatile material.

The **Werner & Pfleiderer** Plastificator for the continuous gelling, plasticizing and compounding of p.v.c. formed a static exhibit on the **John Kimbell** stand. The new granulating head on this machine consists of two sections, the first being conical and arranges for cooling, and the second cylindrical and serves as a strip extruder. The strips pass through the special perforations of the granulating section and are reduced to compact pellets. Pellets thus produced can be extruded without any intermediate processing.

Readers of *Plastics* will recall the article in the July, 1956, issue of the journal dealing with the dry blending of p.v.c., by means of a new mixing machine, manufactured by **The Morton Machine Co., Ltd.**, of Wishaw, Scotland. The complete range of Morton machinery was shown at the exhibition, including the twin worm mixer, designed for the mixing of solids with solids or liquids, where an unusually homogeneous mix is essential. A continuous rubbing action is obtained by this machine while kneading is carried on and movement is made from one side to the other of the paddle box. The construction of this unit is extremely robust and the drive from the motor is by means of multi vee belts to a single plate clutch. The container can be jacketed, if desired, for steam heating or water cooling.

The Lodige Morton mixer was also shown, designed to deal with the most difficult mixes. In this machine, double plough shaped shovels of a careful design rotate inside a horizontal mixing drum which is filled to 60% capacity. The speed is arranged that the mix is picked up and projected into free space to intermingle with other particles and fall back for remixing. In this way a very high degree of mixing takes place in a very short time and, in general, mixing times of one to six minutes can be obtained with dry materials with absolute confidence in all the sizes of mixers. Additional equipment available with this machine includes screening and sifting units, arranged over the filling apertures, special trucks and containers for easy dust-free filling, sack filling adaptors, and overhead charging hoppers.

A range of mixers and blenders with emphasis on models to meet special requirements were exhibited by **Winkworth Machinery Ltd.** Two vacuum models, one 100-gallon Z-blade mixer and a special 65 gallon horizontal U-trough ribbon blade dry blender, were featured. Hand and power operated laboratory mixers were shown including a serrated Z-blade mixer for polyesters.

A new 225 mm. gelling machine at present manufactured by **Andouart** and shortly to be produced in this country was displayed on the stand of **Burtonwood Engineering Co., Ltd.** This machine is capable of compounding up to 800 lb. of material per hour and can be adapted to increase this output to 1,400 lb. per hour.

The machine is normally powered by 110 h.p. constant speed electric motor turning at 1,450 r.p.m. although a variable speed motor can be fitted. This drives either by vee belts or a flexible drive the reduction gearing which is of the gear and pinion type. The barrel is of Martin steel and has a nitrided steel liner honed to a mirror finish. It is electrically heated by tubular heaters in four sections and each section is jacketed for forced air cooling. Between the second and third heating zones lateral slots are provided to receive a split breaker plate. A vacuum outlet is placed close to these breaker plates. The screw which is bored for water cooling has a L/D ratio of 15 : 1 and has Stellite flight tips. The flight comprises two parts separated by a groove to receive the split breaker plate. Two types of head are used with this machine producing granules or sheet for dicing.

The Eck Mixtruder shown by **Industrial Plastics Ltd.** is a compounding and extruding machine which has a capacity of 900 lb. per hour on flexible p.v.c. and 600 lb. per hour rigid p.v.c. The compounding is done by twin screws and the extrusion is by a single screw.

Hydraulic Equipment

PHOTOGRAPHS of the use of their valves and couplings together with actual samples were shown by **British Ermeto Corporation Ltd.**

A range of hydraulic valves was shown for the first time by **George Ellison Ltd.** Designed to meet many different requirements in the control of hydraulic power and the principal features of the range includes smooth operation by hand, foot, solenoid, air cylinder or air diaphragm or hydraulic cylinder. Easily converted from one type of controller to another. Setting during reassembly is eliminated and arrangements are made for manifold mounting. Suitable for pressures of up to 2 tons per sq. in. and for some services they can be used with pressures of up to 3 tons per sq. in.

Vacuum Coating

A CONTINUOUS foil metallizing plant was shown by **Vacuum Metallurgical Developments Ltd.** This plant is capable of coating plastic foil and sheet in various widths at speeds of up to 500 ft. per minute. Although the equipment shown was for foil metalizing, the system employed can be readily adapted for the batch processing of moulded products and several examples of the work carried out were exhibited.

Several vacuum coating plants were exhibited by **Vacuum Industrial Applications Ltd.** These

(Left) The stand of the Morton Machine Co., Ltd. showing some of the mixers exhibited.

(Right) A small laboratory mixer exhibited by Winkworth Machinery Ltd.

The laboratory size continuous vacuum metallizer shown by Vacuum Metallurgical Developments Ltd.

included the E.2H.36, a twin chamber model with each chamber 36 in. deep and 36 in. in diameter, the E.H.60 with a single chamber of 60 in. diameter, the E.V.24 Mark II which is a compact unit designed for fast process cycles and has a chamber height of 24 in. and diameter 24 in. A new plant was shown for the first time having a single horizontal chamber of approximately 24 in. in diameter.

The 18 in. vacuum coating plant shown by Metropolitan Vickers Electrical Ltd., designed for laboratory or pilot plant application.

Welding

THE Kiefel K.M.100 and K.F.200 H.F. welding machines were exhibited by **Coutinho Caro & Company,** through their London agent **E. G. Leonhard Ltd.,** together with a Sendler VGS Jotyplast Junior 2A vacuum forming machine and a Kiefel K.R.S.1450 reel splitting machine. Demonstrations were given of the production of p.v.c. inflatable mattresses using the Kiefel K.M.1200 H.F. welding machines with a 5,000 watt generator.

A high frequency plastics welding machine was shown by Metropolitan-Vickers, as part of a complete range of electrical equipment designed for use by the plastics industry. Other units in this range included a 4 ft. high intensity infra-red projector for curing Latex and p.v.c. coatings and a model was shown of a platen type heater. Three display panels illustrated different types of **Metropolitan-Vickers Electrical Co., Ltd.,** industrial heating elements. The last item to be shown, of considerable interest to fabricators, was the type 27 in. vacuum coating unit for coating plastics or metal articles. A type 18 in. vacuum coating unit designed for laboratory or pilot plant was also shown.

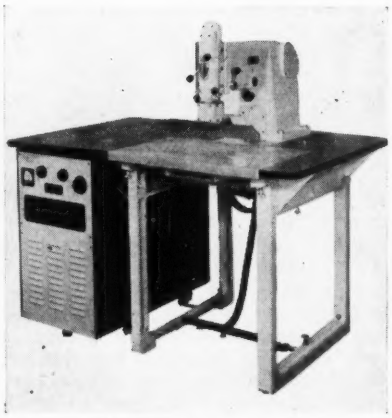
Another interesting display on the same stand was the industrial X-ray equipment which will find application not only in the examination and testing of plastics mouldings, and other fabrications, but also in the examination of tool steels. This particular subject was touched upon recently by the chairman of the Publicity Committee of the British Plastics Federation, who in a statement to the press pointed out the serious problem facing the mould manufacturer and the moulder himself from a point of view of wasted man hours resulting from a flaw in the tool steel which was under normal conditions unknown until sometimes half or three parts completed. Wider use of industrial X-ray equipment will help to ensure that billets delivered to the mould maker are of uniform quality and thus eliminate the tremendous wastage of time which may otherwise occur. It is not uncommon for some 300 or 400 machining hours to be put in before a flaw is discovered which renders the billet completely useless.

It will be interesting to see what developments will take place in the examination of mouldings by X-ray to check the correct positioning of inserts, etc.

Welding presses manufactured by **Körting Radio Werke, G.m.b.H.,** were shown by **Kemitype Ltd.** Demonstrations were given with a 150 Kg. foot-operated press with a 650-watt H.F. generator and a 400 Kg. machine with a 2 kW. generator. Exhibited for the first time was a complete workshop for making welding electrodes to a high degree of accuracy, die electrode strip with and without tear seals is available from Kemitype Ltd.

Radio Heaters Ltd. were demonstrating an extensive range of Radyne plastic sheet welders. Among those shown were the latest improved version of the general purpose pedal-operated welders models W.600, W.800 and W.1250 with power output of 600, 800 and 1,250 watts respectively.

A Radyne W/2P was demonstrated with an electrode for making a large (36 in. × 24 in.) inflatable toy. This press is of two pillar



The Radyne W.21 3 kW. press welder made by Radio Heaters Ltd.

construction which permits the work material to be fed through the press enabling continuous rolls of material to be handled. Power is supplied by a new Radyne 6 kW. generator and the top electrode carrier plate is earthed and allows easy mounting of profile electrodes.

The Radyne P.W.21 table type 3 kW. press welder and the open-span type 3 kW. press W/1P. specially designed for upholstery work were shown. Other press welders exhibited included the Radyne PW/50/S 6 kW. pneumatically operated machine with trolley type loading frames for the mass production of p.v.c. book covers and the Radyne W/4P type "D" large four pillar fast cycling 17 kW. press which has 5 ft. × 3 ft. platens. Radyne Portable Generators type W2 (300-watt output) and W600 (620-watt output) were demonstrated and either can be used with the Radyne plier-type hand welders.

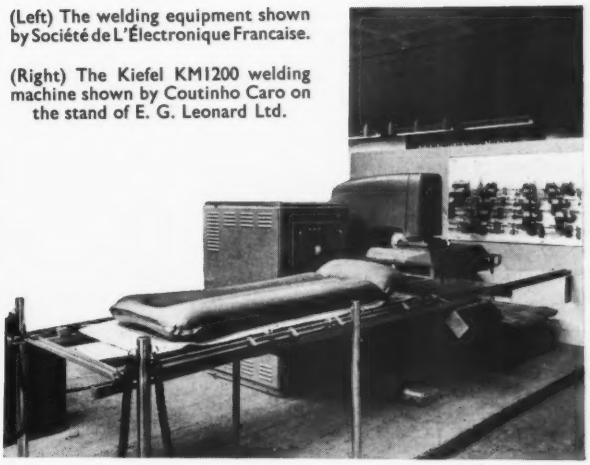
Seven different electronic plastic welding machines were exhibited by **Redifon Ltd.** Probably the largest plastics welding press in the world, the giant JP 16–30 tons 20 kW. press was on view and demonstrations were given using it to produce inflatable air beds from laminated p.v.c. sheeting. Other models shown were Type JP 1B, a 600-watt plastic welder, Type JP7, a 1.2 kW. machine which can be pedal or pneumatically operated and has a welding pressure of 200 lb. A table type welder, type JP14, of which two types were exhibited with outputs of 1.2 and 3 kW. respectively, Type JP12 with a 3 kW. output, a pneumatically operated machine Type JP13 with an output of 6 kW. which can weld up to 9 sq. in. on double thickness 0.01 in. p.v.c., and a 500-watt portable "tongs" type R.F. welder, type JP9. Examples of products made from such welding machines were displayed including scooter-jackets, rainwear, paddling pools, book bindings and purses.

Miscellaneous

TWO electro-hydraulic swing-arm die cutting presses were shown by **J. Sandt A.G.** whose agents are **F. J. Edwards Ltd.,** together with a universal type beam cutting press. The 50-ton beam cutting press has a cutting table of 39 in. by 27 in. and an infinitely variable stroke between ¾ in. and 4 in. This machine can also

(Left) The welding equipment shown by Société de L'Électronique Francaise.

(Right) The Kiefel KM1200 welding machine shown by Coutinho Caro on the stand of E. G. Leonard Ltd.



be fitted with a roller feed. Model ST.128a Mignon swing-arm clicking press has an infinitely variable stroke between ½ in. and 2 in. model ST.120 Maya has a fixed stroke of 1 in. All Sandt machines are silent in operation and require little maintenance and have two hand controls for safety.

The Simco static eliminator was demonstrated by **Sheridan Croxted Ltd.** Its effectiveness in removing static charge from cellulose acetate film was illustrated by the behaviour of pith balls.

A fully automatic hot press stamping machine operated by compressed air was demonstrated by **Phillips Bros. and Ellis.** It is claimed that up to 10,000 impressions per day can be made by this machine which maintains constant pressure at the point of contact despite any variation in thickness of material. The machine was using foils manufactured by the same company.

Milford-Astor Ltd. showed a new machine, the M.20, a new fully-automatic model incorporating the well-known dry printing process and giving speeds of up to 4,000 objects per hour. The machine will work in single or multi-colours and will print on all plastics materials.

An interesting exhibit by **H. Schubert Ltd.** was a curtain coating machine, type LZ. This machine is normally used for applying glue to plywood, it can however, be adapted for coating plastics.

A 4 megavolt electron linear accelerator was shown by **Mullard Ltd.** The accelerator is a small machine and has been designed for experimental laboratory work as well as for production runs. Examples of the irradiation of polythene to increase its heat resistance were shown.

Francis Shaw & Co., Ltd., showed a model calender illustrating the roll bending principle. Roll bending equipment can be fitted to existing calenders by using auxiliary roll neck bearings fitted with special high load carrying capacity gun metal full circle bushes and hydraulic rams arranged at each end of the bowls. The roll bending device gives a variable roll camber enabling uniform gauge thin sheeting to be calendered to a high degree of accuracy.

A new spraying process for mixing and applying glass fibre and resin in any proportions was demonstrated by **Metropolitan Plastics Ltd.** The M.A.S. spraying unit has an air motor to drive the stirring mechanism. It is actuated by the atomizing air escaping to the spray gun and therefore requires no additional compressed air. The automatic air controlled gun is capable of simultaneously spraying cut fibres and two different resin mixtures and each nozzle has independent adjustment. A boat made by Van Rietchoten & Houlens illustrated the use of this machine which is made by **Aust Und Schuttler & Co.,** Düsseldorf.

A number of **Dubuit** silk screen printing machines were shown by **Kemitype Ltd.** Machine No. 104 is automatic with a revolving turret for printing objects with flat surfaces, e.g. box lids up to a maximum size of 6 in. × 6 in. Production rate is 2,000–2,500 per hour which can be increased up to 5,000 per hour by incorporating an automatic feed and ejection mechanism. For printing hollow articles up to 2 in. diameter and 8 in. length, machine No. 31, with an output of 1,000 per hour, was shown. A modified version, No. 31B, has a registration device permitting multi-coloured printing. No. 11 hand printing machine for cylinders and bottles up to 7½ in. diameter can be used for oval shapes, etc., and has a registering device for multi-coloured printing. Shown for the first time was a plastic tubing marker which when coupled with an extruder can mark tubing from 15 to 60 mm. diameter at regular adjustable intervals. The marking is carried out using the hot die and foil principle. Kemitype Ltd. have an extensive technical advisory service on inks and adhesives.

John Kimbell & Co., Ltd., exhibited the new **" Zimmer "** Melt-Coating machine for coating paper, fabrics and other flexible materials with thermoplastic materials. Coated materials can be finished or embossed by using a breast roller.

Demonstrations were given by **W. F. Johnson & Co. (London)** of marking on plastics by the **Printac** " Giftmark " foil marking machine. With a roller foil feed such machines are capable of marking 4,800 combs with a fancy gold design in an eight-hour shift. The maximum printable length is 3 in. with a die, and 8 in. with type, and the maximum height 1¼ in. with a die, and 1½ in. with type. Power consumption is 150 watts. Filing operations were carried out using the Elwas-Discut trimming machines on a range of thermoplastic materials including nylon and polystyrene. This machine is self-cleaning and has sealed bearings.

Collinson's Precision Screw Co., Ltd., exhibited a large number of inserts for electrical mouldings. This company has been supplying inserts for over 40 years and can produce turned parts up to 2 in. diameter and screws from 6 B.A. up to ¼ in. diameter thread.

The Talbot Tool Co., Ltd., showed jig bushes for use in laminate and glass fibre jigs. The first range, Nurogrip, are designed to reduce tooling costs and expedite production. They are of the headless serrated press-fit type jig bush, and are manufactured specially for use with all laminate and glass fibre materials. Their full serrations insure a 100% grip throughout the entire contact surface with no turning or distortion. Bushing the jig with

The Milford-Astor automatic printing machine.

Nurogrips is simply effected by boring a hole inserting the bush and pressing home.

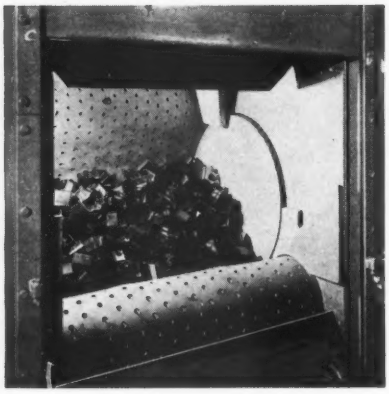
The polygrip range comprise recessed serrated jig bushes, with a knurl designed to eliminate radial movement. These bushes were introduced by the Talbot Company coincidentally with the development of new tooling techniques of glass fibres/resin bonded laminates because of their tenacity and durability they have found wide exceptance by operators of these types of tooling and are now extensively used in conjunction with many moulded structures.

Induction heating equipment was the feature on the stand of **Beanwy Electric Ltd.** The principle of this equipment was given in *Plastics*, July and August, 1956. Equipment shown by this company is used for the induction heating of platens for compression presses, circular heaters for injection and extrusion machines, units for extruders combining induction heating and air cooling, mould heating equipment, bedded preheaters and temperature control and indicating instruments. Also shown by the company was a machinery guard operated by a beam of light.

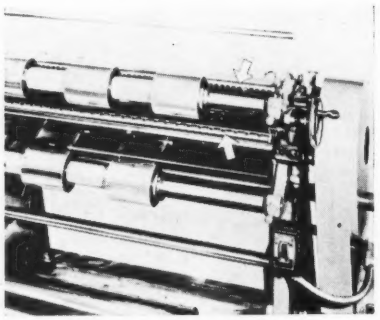
Shown by **Tilghmans Ltd.** was the Wheelabrator plastic deflashing machine, designed to remove flash mechanically from large loads of plastic articles, eliminating individual handling of the pieces. In spite of the great number of parts which can be dealt with at one time, every surface of every piece is completely exposed to the deflashing action of the blast from the high speed unit. As a result of processing in a Wheelabrator plant, the surface appearance of the article is greatly improved and the speed with which flash, thins and burrs are removed is most impressive when compared with manual methods which this technique supersedes.

A table deflashing unit was also shown for dealing with parts too fragile or too large to be dealt with by the Tumblast deflasher, a machine having maximum flexibility for the low cost, high speed deflashing of plastic parts.

Specialized fasteners were featured by **Simmonds Aerocessories Ltd.,** including the range of Spire speed nuts, fixes, and clips. These spring steel fasteners are made for threaded and unthreaded members and are resilient self-locking and vibration-proof. They simplify the design and production of many moulded articles and eliminate in many cases the need for brass inserts, with commensurate economy in materials and assembly costs.



Deflashing compression mouldings in Tilghmans Ltd. Wheelabrator.



The Sheridan Croxted static eliminator shown on a foil slitting machine.

Self-adhesive abrasive discs for the prefinishing of moulds, dies, etc., prior to final finishing, were shown by **Engis Ltd.** These discs are also employed deflashing. Another exhibit, applied to this field, of the company was a diamond compound for polishing and lapping plastics moulds. Abrasive contour finishing heads for deflashing plastic products were also shown.

One of the most interesting machines was that shown by **J. Evans & Son (Portsmouth) Ltd.,** the model G.U. rotary head twin stool high output automatic plant for toothbrushes. This machine, which has been newly designed, provides the answer to the latest injection moulding techniques, whereby toothbrush handles are moulded with precast holes. Under sustained tests in the factory of the company, a popular 20-tuft toothbrush pattern was produced continuously at a very high output rate. Visitors to the exhibition were able to see the machine in detail and no doubt many of the toothbrush manufactures will be greatly interested.

Demonstrations of the various Gardsmen pyrometric controllers were carried out by **West Instruments Ltd.** Their latest instrument is the stepless controller which operates without tubes on a modulating principle. It has extensive controlling qualities and maintains a uniformity of temperature which will be of the greatest value in processing equipment. Proportioning and off-on temperature controllers were also shown.

Shown by **General Engineering Co. (Radcliffe), Ltd.** was the P.14 package impregnation plant. This plant is simplified in operation by the use of electro-magnetically operated valves for all services controlled from a single multiposition switch.

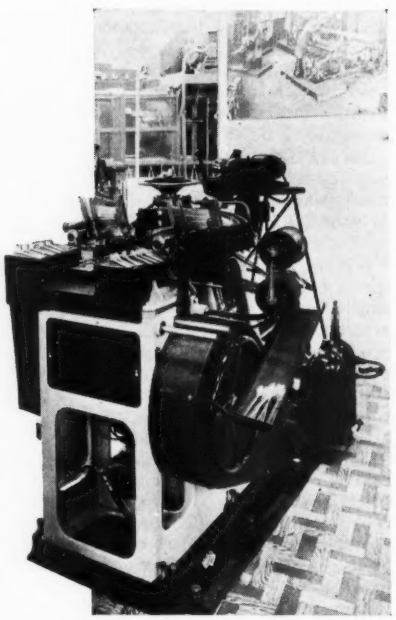
An automatic coiling machine for insulated wires, manufactured by Decombe was shown by **Industrial Plastics Ltd.,** included a spark tester. Production from this machine is reported to be 75 to 80 coils of 100 yards each per hour by one operator. A patented wire guide device requiring no traverse mechanism and a special collapsible coiling frame which ensures quicker removal of the coil are two features of this equipment. Automatic length measurement and quality control through the spark tester, together with a special cutting knife, are other points of interest.

A range of high tension and wet spark testers manufactured by **Schmitz** were shown by **Ed. Brand Ltd.** Four different models of this tester are produced with two different testing voltages and three different capacities. The electrode is specially constructed to ensure that the cable has the largest contact surfaces in the smallest space. It is of the brush pattern, 9.8 in. long, and has three brushes so arranged that the whole surface of the cable is surrounded by the bronze bristles. Cable faults are registered by lighting a signal lamp and also by registering it on a counter.

Also shown by the same company was the Schmitz Ditome 54, which is a diameter measuring and control apparatus. This machine consists of two chromium plated rollers one of which is fixed and the other mounted on a pivot. The scanning roller transfers variations in the diameter through a lever system to the control contacts. The tolerance range allowed is up to $\pm 1/100$ mm. The control instrument contains electronic time switches which give the servo motor exactly timed current impulses. It is thus possible to correct in a very short time any variations in the diameter of the extruded product.

The Department of Scientific and Industrial Research, in co-operation with the **National Research Development Corporation,** demonstrated a prototype pneumatic gauge measuring device. This device was developed by the **National Physical Laboratory** for Courtaulds for the continuous measurement of cellulose acetate sheet.

A welding machine shown by **F. J. Edwards Ltd.** attracted considerable interest at the exhibition. It has been designed to be used in collaboration with the vacuum forming machine supplied by the same company. In this way, when two processes are involved, for instance, in the manufacture of packages, where forming is followed by welding, so the problem of matching the moulds with the welding electrodes, both from different sources, is entirely eliminated.



The G.11 toothbrush manufacturing machine shown by J. Evans & Sons (Portsmouth) Ltd.

The British Plastics Convention

Record attendances indicated the great interest in the series of papers presented at the 1957 Convention, organized by "British Plastics." One paper drew an audience of over 800. The following commentary by Dr. J. Glazer and Dr. N. H. Langton on the papers and discussions following them has been prepared to highlight the major points made by the lecturers and members of the audience. The sequence of summaries follows that of the Convention.

SYNTHESIS AND PROPERTIES OF OLEFIN AND DIENE POLYMERS

By *C. G. Overberger and H. Mark, Polytechnic Institute of Brooklyn, U.S.A.*
(Read by *Prof. H. Mark.*)

OVER the last four or five years a number of methods for synthesizing macromolecules with structures different from those prepared previously have been developed. Although there are a number of apparently different methods, the hypothesis was put forward by Professor Mark that these methods might all be manifestations of a general principle. If so, this would be a welcome simplification, and this paper dealt with the attempts of the authors to formulate such a principle.

The methods used to prepare linear polyethylene and other polymers with a controlled cis-trans structure were listed as follows:—

(1) The use of metal halide metal alkyl complexes in suspension.
(2) The use of Li-metal and Li-alkyls.
(3) The use of metal oxide complexes; and,
(4) The use of high pressures and radical initiation.

A diagram was shown to illustrate the methods of addition polymerization, and the different methods of initiation such as using negative radicles, positive ions, etc., in solution or emulsions. In all cases it seems as if the reaction can be controlled by the addition of monomer. In the case of previous methods, the mobility of the chain ends could not be controlled; it was possible to affect only the beginning and end of the process, the intermediate reaction could not be effected. In general, the new methods enable a systematic control of the reaction itself to be obtained.

To control the reaction we must have control over the charges appearing at the ends of the chains, and be able to control the rate of propagation of the chain reaction. The role played by active centres in the polymerization was considered. To investigate the behaviour of the metal complexes used as catalysts, it is necessary to polymerize under controlled conditions, and to measure the rate of differential conversion avoiding side reactions which would complicate matters. Industrial data is of little use, because the catalysts used are too active and the rate of conversion too high. The catalysts used industrially produce many different types of active centres, each of which produces its own polymer of a certain molecular weight, so that the resultant product has a wide molecular weight distribution. For this reason, the authors used their own catalyst, a nickel complex, which had a smaller conversion rate and would therefore be useless for industry, but which was very convenient for following the course of the reactions.

The course of the polymerization reaction under the influence of the catalyst was followed by making viscosity measurements which enabled the molecular weights to be estimated. The results of these experiments led the authors to postulate that the metal complexes form active sites, each of which acts as a source of polymer molecules. A continuous rearrangement of the electronic structure of the metal complex causes an " unrolling " of the polymer from the active site. This " reeling-off " action was illustrated in a series of diagrams in an attempt to visualize the process. This theory can also be used to explain the effects of catalysts upon the molecular weight distribution of the polymer so prepared. The idea at least gives a working hypothesis of the action of the metal complexes.

Amongst the many questions which followed this very interesting paper was one asking if there were any physical methods for following the proposed unreeling mechanism. Professor Mark said that experiments using different catalysts but of the same particle size, as measured by nitrogen absorption methods, showed that the amount of activity does depend upon the amount of alkyl complex, but that the results of experiments on the whole were inconclusive and the physical basis for the theory was difficult to establish. In reply to a question about the factors influencing the molecular weight distribution, it was stated that this depends upon the number of different active centres present. Each centre produces polymer of a certain molecular weight which will be different from that produced by a different type of active centre. Another questioner asked about the charges on the surface of the catalyst and upon the ends of the growing radicles. Professor Mark replied that it was not easy to say anything definite, but that there was probably a negative charge on the catalyst and this initiates the action.

SOME ASPECTS OF LOW-PRESSURE POLYTHENES

By *E. Grams, Farbwerke Hoechst AG.*

THIS paper dealt with some of the problems concerned with the production and characterization of high-density polythene produced by the low-pressure process. The characteristic features of high-density polythene produced this way are well known, but it is essential that methods should be developed for obtaining a satisfactory description of the new materials, both from the points of view of molecular structure and of molecular weights.

The use of infra-red absorption spectroscopy can show the degree of chain branching and also detect double bonds and other groupings. This method is difficult for routine work, however. Since these materials have a small solubility it is difficult to measure their molecular weights by the usual methods. The osmotic pressure method is impracticable, whilst the viscosity method is only of use if the molecular weight distribution is known beforehand. The light scattering method is probably the most applicable. The ebullioscopic and cryoscopic methods can also be used for molecular weight determinations. The degree of crystallinity of low pressure polythenes is easy to measure and the relationship between this and many of the physical properties of the material is well developed.

The author next mentioned the spiral injection test and stated that it gave good results for low pressure polythenes, giving correlations with melt index and viscosity measurements. A graph showing the spiral lengths for various injection temperatures was shown. The use of the melt index as a characterizing index was mentioned further, and it was stated that the dependance of this upon pressure leads to a simple relationship. Spiral injection test curves for both low and high pressure polythene materials were shown. The slopes of the curves is important, because at high temperatures above about 280° C. the two curves cross. Hence at least two points for different temperatures should be found in practice so that there is no doubt about the inclination of the curve.

An important method of determining the probable behaviour of materials is to obtain the stress/strain relationship. Such curves for both high and low pressure polythenes were shown. The various factors which are likely to influence the results of stress/strain measurements were discussed. The thickness of the test piece is very important, and the influence this has upon the results depends upon the type of polymer being tested. The shape of the test piece is of equal importance, and its influence is most pronounced for highly crystalline materials. The straining rate used in the tests also influences the results. Diagrams were shown to illustrate the effects of all these factors upon the stress/strain curves for different polymers. The influence of temperature upon the stress/strain curves for both high and low pressure polythenes was mentioned, and some experimental results showed that the low pressure material at fairly high temperatures (about 80° C.) tended to behave like the high pressure material at lower temperatures.

The relationship between the degree of crystallinity and the physical properties of the materials was now considered. The influence of crystallinity upon the stress/strain curves was shown to be affected by the heat pretreatment of the low pressure polythene. Altering the degree of crystallinity by thermal pretreatment was stated to have an effect upon the tensile strength which depended upon the size of the primary crystals, which varied from about 100Å to about 350Å. The amount of crystallinity and the size of the crystals had a far greater influence upon the stiffness of the material, except for the case of the high pressure material where there was no effect

upon the stiffness. In the case of the low pressure polythene, the stiffness increases with crystal size, whilst there was little effect for the high pressure material; here the stiffness remained constant whilst the size of the crystal varied from 180Å to 200Å.

The author oncluded with some practical results based upon the above considerations, with special reference to ageing. He said that there is no satisfactory method for its measurement. We cannot follow ageing degradation using viscosity or osmotic methods, because the material may become progressively partially insoluble. The best methods of investigation are infra-red or the determination of melt indices. It was not possible to state any connection between ageing and the deterioration of the properties of the material. It was possible, however, to say that the presence of oxygen was an essential factor in the ageing process. The ageing characteristics may be improved by the addition of carbon black to the material.

In the discussion that followed this paper, the author pleaded for some suggestions for standardizing the identification of the various polythenes, but there were no proposals from his audience as to ways in which this might be done. In the paper, the sizes of the primary crystals had been referred to several times, and the author was asked how these measurements were obtained. Dr. Grams stated that whilst an X-ray method had been used, he could not say how the actual crystal size had been determined, neither could he say, in answer to another question, in which direction, with reference to the polymer chain, the crystal sizes had been measured. He was also asked about the behaviour of the crystals in a test piece as it stretched during a tensile test. In answer he said that the crystallites probably distort but the amount of crystallinity will remain practically unaltered except for possibly a slight increase. As to the role played by carbon black as a thermal anti-oxidant, Dr. Grams answered that the effect does depend upon the concentration of the black. A concentration of about 1.5% is best, and as the concentration is increased the effectiveness of the carbon black decreases.

THE LIGHT SCATTERING OF POLYTHENE IN SOLUTION.

By *S. W. Hawkins, P. B. McFarlane, F. Yearsley, I.C.I., Alkali Division.*
(Read by *Dr. Hawkins.*)

SINCE 1944, much work has been done on the use of light scattering methods for the determination of the molecular weights of high polymers in solution. Little attention has been paid to polythene, however, because there are a number of special practical problems in the case of this polymer. Experiments with p.v.c. began in 1953, when the weight average molecular weight was estimated from the light scattered at 90°. Viscosity measurements were used to obtain the correction for dissymmetry. The bi-linear extrapolation method due to Zimm was used to interpret the results of these early measurements. In this way it is possible to obtain a number of parameters which are characteristic of the polymer molecule, such as the weight average molecular weight $\overline{M}_w$, the second osmotic virial coefficient A_2 and the degree of branching. The work of these early investigators indicated the need for a more flexible type of apparatus where the scattering at various angles could be accurately measured, and the light cell could be kept at a constant elevated temperature of 150° C. Such an appartus has been designed by Dr. Hawkins and his collaborators and was described in this paper, together with some of the results they have obtained. The equation used by the authors for the calculation of the molecular weight $\overline{M}_w$ was shown. This equation contains A_2 and other parameters, and it is necessary to use a double extrapolation on the Zimm plot to obtain values.

This technique has been applied to solutions of p.v.c. in *a*-chlor-naphthalene, the polythene samples used being typical of the types obtained from various manufacturing processes. Both high and low density materials were investigated. The presence of impurities can be detected from the shape of the experimental curves, and although such impurities can be removed by centrifuging, this process must be used with care to avoid altering the molecular weight distribution of the sample. It was found that the second virial coefficient A_2 showed values which decreased with decreasing angle of scattering. It is suggested that this effect is due to the presence of large molecules which are branched. To investigate the effect of branching, preliminary results must be obtained using linear polymers. A relationship connecting $\overline{M}_w$ with A_2 has been obtained previously by Atkins, and is:—

$$A_2 = 0.06\overline{M}_w^{-0.35}$$

The authors have confirmed the fact that the values of $\overline{M}_w$ are generally much larger than the number average molecular weights for the polythenes investigated. Since a convenient index of the molecular weight distribution is the fraction $(\overline{M}_w/\overline{M}_n)$, where $\overline{M}_n$ is the number average molecular weight, it is deduced that the polymers prepared by different methods all have a broad molecular weight distribution.

The apparatus used by the authors was described. It consists of a light source, which was a mercury arc, followed by a collimator and optical filter system. The beam of light was then split. Part of the beam was observed by a photo-multiplier and used as a standard of comparison, whilst the remainder of the beam was further collimated and focused on to the optical cell. This latter was cylindrical so that the light through the solution was parallel. The scattered light was detected by a photo-cell on a radial arm which could be rotated round the cell so that the angle at which the scattered light was observed could be varied. The output from the photocell was fed to a bridge whence it could be measured and the amount of light scattered at any angle measured by comparison with the input intensity. The results were used to obtain the Zimm plots, from which the information about the molecular weight distribution and the degree of branching were obtained. The presence of giant molecules were detected which could account for the high values of $\overline{M}_w$ which were obtained. The scatter at angles near to 180° was characteristic of the matrix material. Experimental results were tabulated for four polythenes and the results of the Zimm plots compared with the dissymmetry methods. This work enables an empirical index of the degree of branching to be derived.

The second virial coefficient A_2 was found to have different values for different samples of polythene, and its value for any one polymer sample depended upon the angle of observation of the scattered light, and it was suggested that this might form the basis of a means of investigating the degree of branching present in a solution of a heterogeneous polymer. The authors found the relationship $A_2 = 0.07\overline{M}_w^{-0.37}$ which is seen to be very similar to that found by Atkins. Values of A_2 for various angles of observation round the cell for alkathene were compared with the calculated values. For some samples of this polymer, the variations were greater than one would expect for a linear polymer. It is probable that this type of discrepancy is due to branching and thus an index for the degree of branching can be obtained.

This paper shows how, by the use of a refined technique and improved apparatus, it is possible to obtain important and interesting information about the molecular characteristics of high polymers in solution. Some of the results, such as the existence of giant molecules, could not be obtained by the usual methods of investigation. A great advantage of this method is that it is not necessary to make assumptions involving the use of mathematical models to obtain results, as is often necessary in other methods of investigating molecular weight distributions.

THE PERMEABILITY OF HIGH-DENSITY POLYTHENES

By *V. T. Stannett, State University of New York.*

THIS paper described the results obtained from experiments upon the permeability of polythenes of different densities to gases and vapours. Polythene samples varying in density from 0.915 to 0.960 were used in the investigations, and the gases used included oxygen, nitrogen and carbon dioxide. For the vapour experiments, water and organic vapours were used.

The results were interpreted in terms of the crystallinity of the material exposed to the gases or vapours. The permeability process is one involving solution, diffusion and evaporation. The polymer chains are sufficiently mobile to attain a state of quasi-equilibrium rapidly. The permeability is due mainly to defects in the crystal lattice of the polymer; there is hardly any permeability through the crystals themselves. The effect of temperature upon the permeability constant was discussed, and a table of values of this quantity for polythene exposed to various gases was exhibited showing the temperature dependence. A table showing the results obtained with water vapour was also shown.

Finally, some results obtained using irradiated high density polythene films were discussed.

STRESS CRACKING IN POLYTHENES

By *James A. Reid, Phillips Petroleum Co.*

THIS paper was mainly concerned with the problem of the long term failure of polythene material due to stress cracking. Results were compared for polythenes prepared by both the low and high pressure methods. The author listed three main types of long term stress failures. These are, ductile failure at high stresses or high temperatures, environmental

cracking at moderate stresses, and brittle failures which take place at relatively low stresses and over long time periods. The type of failure which is most likely to take place depends to some extent upon the linearity of the polymer. The behaviour of the material is closely connected to its density and molecular weight, and hence to the viscosity of the polymer. A chart of the processibility of high and low pressure polythenes in terms of their densities and viscosities was shown, and the regions of easy processing and useful properties indicated.

The author then went on to discuss the connections between creep and degree of crystallinity of polythenes and the type and frequency of failures. In the case of linear polymers, it is possible to improve the resistance of the material to stress cracking by increasing the molecular weight of the material. This procedure, however, introduces processing difficulties. The effect of varying the molecular weight upon the failure resistance of the material was shown in a table.

Creep studies, when the material is kept under constant load, are important, since long term failure is associated with creep. Decreasing the amount of creep is beneficial from the stress failure point of view, and can be done by increasing the density of the material. Most factors which will stabilize the polymer against creep cause an improvement in the tendency of the polymer to fail under conditions of long term loading.

Finally, the author discussed the effects of irradiation both by ultra-violet light and by high energy nuclear radiations upon the stress cracking properties.

In the discussion which followed, the effect of carbon black loading upon the stress cracking resistance was raised. It was stated that measurements show no improvement, on the resistance being improved, if at all, by only a minor amount.

The author had mentioned the beneficial effects of certain additives on the stress cracking resistance of polythene. He was asked what effect these additives would have upon the high frequency power factor of polythene. He replied that, for measurements taken at 1 kc/s. and 25° C., the permittivity changed from 2.35 with no additive to 2.67 with 2% additives, whilst the loss factor changed from 0.002 to 0.0011 under the same circumstances.

THE PHYSICAL PROPERTIES OF LIGHTLY PLASTICIZED P.V.C. COMPOUNDS

By *R. A. Horsley, BX Plastics Ltd.*

It is well known that p.v.c. is difficult to process alone, as rapid decomposition is likely to occur. This is avoided by the addition of small amounts of plasticizer to the p.v.c. before processing. It is therefore of importance to find out the effect of the addition of small amounts of plasticizer to p.v.c. and its co-polymers. In this very interesting paper, Mr. Horsley described the effects of low plasticizer concentrations upon the properties of the polymer. A surprising anomaly occurs in many cases, and it has been found that the addition of up to 12 parts of plasticizer per 100 parts of resin can cause an increase in the hardness of the material instead of the expected softening. As the proportion of plasticizer is increased from 12 parts/100 to about 20 parts/100, the brittleness gradually disappears from the sheet of material and the plasticizer action becomes normal. The lecturer described this effect for several resin and plasticizer combinations, and gave details of the accompanying changes in physical properties of the products.

The increase in brittleness is marked by a decrease in impact strength. It is thought that the effect is due to an increase in the inter-chain order of the material, that is, to an increase in the crystallinity of the long chain molecules. The crystallinity of the lightly plasticized material has been studied using X-ray crystallographic methods, and subjecting the resulting photographs to a micro-photometer investigation to obtain quantitative results. Some curves were shown giving the relationship between the halo intensities of the X-ray results and the proportion of plasticizer. It was seen from the curves that the amount of crystallinity increased with the initial addition of plasticizer, and then began to decrease after the percentage of D.O.P. had reached 10%. The corresponding curves showing the variation of impact strength for the same material showed an initial drop, and then an increase, as would be expected if the theory that the effect is due to crystallinity is correct. It would be expected that a similar phenomenon would occur for resins other than p.v.c. The results of impact tests on three different resins lightly plasticized with D.O.P. were exhibited, as were also curves for different plasticizers. These results confirm the conclusions reached from the X-ray diffraction experiments.

Similar anomalous variations in the tensile strength, Young's modulus and resilience values have been noticed as the amount of plasticizer is gradually increased. Measurements for three different resins show that the tensile strength increases at first as the proportion of D.O.P. is increased, and the expected softening does not occur until more than 10 p.p.h. of plasticizer have been added. Similar variations are shown for measurements of modulus.

After the initial investigations described by the author, further work was carried out measuring only tensile strengths and moduli so as to avoid the use of large quantities of material. Results were also given for materials which had been heated and quench cooled. The anomalous effects for low plasticizer concentrations were found in all cases.

The effects can be satisfactorily explained as being due to an initial increase in degree of crystallinity. It is postulated that the plasticizer resides at first in the amorphous regions of the material. As the amount of plasticizer is gradually increased, the degree of crystallinity increases until the mobility of the chains in the amorphous region becomes great enough to start to break down the crystallites. After this concentration has been reached, further increase of plasticizer concentration produces the usual softening effect, the degree of crystallinity gradually decreases and the physical properties become normal.

This theory was confirmed by measuring the refractive indices of the material at various temperatures using an Abbé refractometer temperature controlled in the usual way. As the temperature increases, there was a marked change of slope of the curve at the temperature of the second order transition point. The variation of the second order transition temperature with D.O.P. loading was shown. All the results given by the author confirmed the theory that this interesting anomalous effect is closely connected with the degree of crystallinity of the lightly plasticized material.

FOAMED POLYVINYL CHLORIDE

By *D. A. Lever and G. Burke, British Geon, Ltd.*
(Read by *D. A. Lever.*)

THIS paper was concerned with the development of the various processes which can be used for the production of p.v.c. foams. The speaker classified the main methods used under the following five headings:—1. by means of chemical blowing, 2. using the whipping process, 3. the elastomer method, 4. microcellular techniques involving the leaching out of metal salts from the material, and 5. the use of high pressure gases. Each of these methods was then considered in turn.

In the case of chemical blowing, the efficiency of the blowing agent is measured both in terms of the amount of gas produced by unit mass of the agent, and also by its cost. The production of flexible and hard p.v.c. foams by this method was outlined. Both inorganic and organic blowing agents can be used, and several types were mentioned. The methods used to produce open cell and closed cell materials were described.

The speaker said little about the whipping method of producing foams, because this is not in common use nowadays.

According to the authors, the most interesting development in the production of foam in the last few years is the growth of the elastomer method. It is usual to use carbon dioxide as the inert gas, under a pressure of 500 lb./sq. in. The resulting mixture is either sprayed on to a belt and gelled by radio frequency heating, or else sprayed into a hot air oven. The expansion of the included gas produces the foam. In order to understand the process it is obviously necessary to know about the behaviour of CO_2 at a pressure of 500 lb./sq. in. at the temperatures used. An Andrews' diagram was exhibited which showed that the gas was in the vapour/liquid phase under these conditions. On the removal of the material containing the included gas from the refrigerated mixer into a region of atmospheric pressure and high temperature, the expansion which takes place in the paste will be governed to some extent by the surface tension of the material. The effects of surface tension oppose the expansion of the gas. Thus the time allowed for expansion and the rate of gelation are important factors in deciding the size of the pores. The use of plasticizers is also important, as their addition may reduce the initial gas pressure required.

For the continuous production of foam film, radio frequency heating is most convenient and is to be preferred. The rate of rise of temperature of the material in a high frequency electric field depends upon the loss factor of the paste. Plasticizers influence the rate of heating by varying the electrical properties of the material. For example, T.T.P. gives the most rapid temperature rise, D.O.P. is intermediate whilst D.O.S. produces material which heats most slowly in the field. Changes in the value of the loss factor with temperature need to be in-

vestigated, and the problem of the best design for the electrodes of the heater is important.

The production of microcellular materials, involving the leaching out of small particles was not really within the province of the paper and was only briefly mentioned.

In general, the p.v.c. paste methods allow of the widest variation in the nature of the final product, and these methods are the most flexible of those considered.

After describing the various methods for producing the foam, the physical properties of the final product were described and compared with the properties of other natural and synthetic cellular products. Attention was also directed to the methods of manufacture and how they influenced the nature of the final product. Polyvinyl foams can exhibit very different physical properties although the densities of the different types may be all the same. A large amount of the foam is used for cushioning applications. From the point of view of comfort the stress-strain properties of the material are important. The stress-strain curves for three different types of foam product were shown. Natural rubber foam gives a linear stress-strain relationship over the range shown, and the vinyl material curve was very similar to this. On the other hand, polyurethane foam gives a non-linear stress-strain relationship and the material becomes hard after the initial deformation. The work required for a sleeping person to turn over on a mattress depends upon the area of the hysteresis loop on the stress-strain diagram, and the curves exhibited show that a vinyl foam mattress would require much less energy than one made from urethane, and therefore would probably promote a sounder sleep. Polyvinyl foam can replace natural rubber foam from the point of view of comfort, as the two materials show similar stress-strain properties. The vinyl material has, however, one great advantage over the natural rubber product in that a much greater range of formulation is available so that the properties of the final product may vary more widely. For seating uses, the vinyl material has the useful property of being self-extinguishing in the case of fire. Cushions and similar products can be made very easily by the use of radio frequency heating, as the welding of film and foams by this method is very effective.

This paper provided many interesting talking points in the discussion that followed, some of which are mentioned below.

The possible use of D.A.P. or of D.O.P. as the sole plasticizer for making cushioning was considered. This type of foam is not the easiest to make, but the speaker thought that it should be possible to make the material this way. In the same connection, a questioner enquired about the effects of long-term loading of the vinyl foams. It was stated that these materials seem to exhibit very little permanent set. Although there may be a temporary set, the recovery time is of the order of a few seconds. Mr. Lever was asked about the possibility of using p.v.c. foam for cable insulation. He replied that it is not used in this connection, but since it is possible to extrude the material it should be possible to use it for covering wire. Another questioner wanted to know if it would be possible to make lengths of foam sheet ½ in. thick by 12 in. wide which would recover by 75% after a 50% compression. The reply was that it should be possible to produce such a sheet by the elastomer method or by chemical blowing. The recovery after deformation would take place but would not be instantaneous. The lecturer was then asked if the dimensional stability of hard foam material could be relied upon. He replied that the stability was reasonable but time dependent. Reverting to the question of comfort, a questioner asked if there was any relationship between the density of the material and the comfort of the resulting cushion. Although it is difficult to measure comfort, the lecturer said that for natural foam rubber such a relationship did exist, because here we cannot vary the nature of the foam very much without altering its density. For p.v.c. foams however, there is no such connection, because here it is possible to vary the load carrying ability of the material without varying the density, and hence the degree of comfort tends to be independent of the material density. The final question was about the possibility of producing porous p.v.c. material in length continuously. Mr. Lever stated that such a process is possible.

HIGH IMPACT RIGID VINYL MATERIALS

By *Clarence E. Parks and G. B. Jennings, B. F. Goodrich Chemical Company.*

(Read by *C. E. Parks.*)

THE main purpose of this lecture was to describe the properties of this new material, and to compare them with those of normal vinyl materials. Some of the uses to which the material has already been put were also mentioned, and several examples of fabricated articles, both by moulding and extrusion, were exhibited.

The speaker introduced his topic by mentioning the difficulty in obtaining a satisfactory measure of impact strength. In spite of the many different tests, however, there was one which gave indisputable results. Mr. Parks then demonstrated this impact test by producing a large hammer, and violently striking the bottom of an inverted dish of high impact material, which survived this test, which although crude was certainly very effective.

P.v.c. was originally used for cases where an outstanding resistance to chemical attack was required. Later it became apparent that a tougher and more rigid material would have many uses. Such a material was finally developed and called Geon 8700. The processing of this new high impact vinyl material is very similar to that of normal p.v.c., and in some cases it is even easier to handle. For example, it rolls better than the normal material. On the other hand, it has a lower thermal conductivity and requires the use of an internal mixer at a temperature of 360° F., after which it can be transferred to a two-roll mill. The resulting material can be extruded satisfactorily, using an extruder temperature such that the extruded material is between 340 and 375° F. approximately. The extrusion rate should be slightly higher than for normal p.v.c. Moulding of normal low impact strength p.v.c. is generally considered a difficult operation, and the same difficulties are met with in moulding the high impact material.

High impact p.v.c. retains most of the chemical, electrical and aging characteristics of the normal material. Several tables showing the corresponding values of various chemical and physical properties of the normal and the new material were exhibited by the speaker. For example, the thermal conductivity of normal p.v.c. is 3.5 whilst that of the high impact material is 4.5 $.10^{-4}$ c.g.s. units. The dielectric constant (permittivity) of the new material is 3.9 as against 3.7 for normal p.v.c., so there is very little change here. The power factors are somewhat different however, the high impact material having a value of 3.9 whilst that for normal p.v.c. is 2.8, both values being for 1kc/s at 30° C. A table comparing the effects of ageing, upon the physical properties of both materials, showed that the new material loses its impact strength so that in three years' exposure the value falls from 15 to 10. The tensile strength shows a decrease with temperature as does the normal low impact p.v.c. For these tests, the impact strength was measured using a falling ball.

Particular reference was made to the properties of pipes made from the new material, as a successful application of the material in this form has been carried out for the United States Navy. Photographs of a spectacular flame resistance test were shown, when pipes of the material were exposed to the flames of fuel oil for several minutes. Photographs of the pipes after exposures of 7 minutes showed that only the outside was damaged. The carbonization of the surface sets up a resistance to further deterioration.

The last part of the paper was taken up by a film describing the use of pipes of the material on U.S. naval vessels. One of the potential dangers to shipping from underwater atomic bomb explosions is the contamination of the exposed surface by radio-active spray. This effect can be minimized by continuously spraying the surface of the vessel both before and after the explosion with sea water. For this purpose, pipes of the high impact material feeding jets have been placed round the ships. Service trials have shown that the material is successful in withstanding the effects of high pressure sea water for a considerable length of time. The effect of the impingement of high pressure sea water travelling round a bend in the pipe was raised in the discussion following the paper. It was stated that the impingement resistance was good.

The speaker could not give the formulation details of the material however, as the material is still under development, neither could he produce any figures giving the relative shear strengths of the normal and high impact materials. Since shear strength is related to hardness, it is probable that there would be a slight reduction. In answer to another question, it was stated that the material is apparently non-toxic and can be used for piping drinking water. Questions on processing ended the discussion on this very interesting material. Mr. Parks stated that the material can be hot gas welded as easily as normal p.v.c., and that it is somewhat easier to machine.

SOME ASPECTS OF LOW-PRESSURE POLYTHENE PIPES

By *Herman Paul, Chemische Werke Hüls.*

THIS paper described briefly current developments towards the use of low-pressure (L.P.) polythene in pipes, with a view to their even-

tual use for drinking-water transmission. Owing to the higher s.p. of L.P. polythene, compared with rigid p.v.c., more efficient heating is required during extrusion. This has been obtained by induction heating methods. By blending high density L.P. with low density L.P. polymer, a mixture has been obtained which shows improved flow characteristics over the corresponding homogeneous material, without a reduction in intrinsic viscosity.

In an attempt to eliminate the effect of processing history from the inherent physical properties of the material, tests were made on moulded plates as well as on sections of extruded tube. Ageing effects due to oxidation were eliminated by the inclusion of 1–2% carbon black. By annealing the material in water at 100° C. prior to testing, internal stresses were dissipated and properties were improved. Test lengths of piping were built up by fitting the tube ends into glass-fibre reinforced sleeves, coated with a thermosetting polyester adhesive, and curing. When such specimens were subjected to burst tests, failure occurred in the tube rather than at the joint.

Results of burst tests and bacterial tests showed that L.P. polythene piping is eminently suitable for drinking water transmission, although the estimated life-time of 20 years is disappointing when compared with those of metal and p.v.c. pipes. However, it is hoped to extend this period by the use of new stabilizers that have very recently been developed.

SOME RECENT DEVELOPMENTS IN EXTRUSION

By *A. Kennaway, I.C.I. Ltd., Plastics Division.*

THE author introduced his paper as an attempt to bridge the wide gap between the theory of extrusion and its practice in the plastics industry. Recent work has accentuated the need for a more fundamental approach to the melting and flow processes of polymers such as occur when a polymer is forced by a screw through an extruder barrel. Although analytical methods have been applied to the flow of liquids, the behaviour of solid polymer granules and their transition into molten polymer along the barrel required investigation. A preliminary study of these problems has now been made, with a transparent extruder barrel and screw, and results of great interest have been obtained. For example, it has been shown that negligible mixing occurs while the polymer is being transported along the barrel by the screw, this being true under both open and closed die conditions. A colour ciné-film illustrated this point beautifully. A second film, dealing with solid particles suspended in glycerine, illustrated well their irregular flow behaviour under extrusion conditions. Studies such as these are clearly necessary if fundamental advances are to occur in extrusion.

A high speed extruder, operating at 1,000–2,000 r.p.m., would have great economic advantages.

Unfortunately, the rate-determining stage is the melting of the polymer and it is this step that proves the most power consuming. At high speeds, the screw carries the polymer as a solid right through the barrel and the polymer melts only towards the end of the barrel or even in the extruder head. Inside the extruder head, the polymer is molten and exhibits non-Newtonian flow up to and through the die. Rheological studies of flow and stress conditions inside the extruder head are essential if smooth extrusion is required at ever increasing speeds. The author mentioned recent work by Clegg who has shown that, at high shear rates, extruded polythene develops surface roughness when the parameter " n " changes radically in the empirical relationship: shear rate = const. $\times$ (shear stress)^n. A further cine-film was then presented showing how turbulence could be overcome by improved die design, thereby allowing the production of smooth extrudate at higher speeds.

Finally, a simplified barrel-thermostat device was described consisting of several cuffs, concentric with the barrel, each containing a liquid of known b.p. A judicious choice of liquids enables accurate control of the temperature gradient along the barrel to be maintained under extrusion conditions.

DEVELOPMENTS OF EXTRUSION IN GERMANY

By *G. Schenkel, Paul Troester Maschinenfabrik.*

THE author presented a review of modern developments in the extrusion field, liberally illustrated by his company's products. At present, it is necessary to dry the raw polymer by vacuum oven, tumbling, etc., before processing, although the manufacture of extruders incorporating escape channels for volatiles would eventually cut out the pre-drying process.

A granule-forming machine was described in which the pellets are formed by feeding powdered polymer into a pair of interlocking " gear-wheels " between whose teeth are situated cylindrical channels in which the pellets are formed by compression as the wheels rotate. The wheels may be heated if necessary.

From 1952 to the present, sales figures showed a well-defined tendency towards the production of extruders of increasing diameter, and current models incorporate induction heating mechanisms which provide a more rapid heat response. On the output side, examples of automatic cooling and cutting devices were shown, the extruded pipe being cooled by spray jets of water. This method of cooling is claimed to be more efficient because (*a*) fine particles of water are somewhat colder than bulk water, and (*b*) the method prevents the formation of a dead layer of warm water adjacent to the pipe.

THE INFLUENCE OF PRE-PLASTICIZATION IN INJECTION MOULDING

By *E. Gaspar and M. G. Munns, Projectile and Engineering Co. Ltd.*
(Read by *E. Gaspar.*)

THE author commenced with a brief account of the difficulties involved in the design of an efficient injection moulding machine of the orthodox type and showed how the introduction of a separate pre-heating stage (pre-plasticization) simplifies the design and improves the moulding qualities of the machine.

The quality of a moulded product depends, *inter alia*, on the control of the injection rate into the cavity as well as the cavity pressure and temperature, Incomplete control may lead to ejection difficulties in addition to dimensional inconsistency, internal stresses, crazing and cracking of the product. The latter defects may be detected by solvent resistance tests. In a single-stage machine good control is difficult to achieve, whereas the introduction of a pre-heating chamber separates the melting process of the thermoplast from its transmission to the mould, thus allowing more efficient control of both of these processes. From the processing point of view, a pre-plasticizer has the following advantages: (*a*) improved temperature control of the thermoplast, (*b*) improved control of cavity pressure and reduction of localized pressure rises, (*c*) higher and more constant rate of filling and (*d*) lower locking force requirements. The author quoted cases where the introduction of a pre-plasticizer had increased production rates by 30 to 40%.

Pictures of products viewed in polarized light showed large reductions in internal stresses when compared with similar products moulded by orthodox injection moulding machines. For a polythene cap, a tolerance of $\pm 0.003''$ was easily obtained with a pre-plasticizer. This could not have been achieved using conventional machinery. By allowing lower injection pressures, pre-plasticization results in *ca* 50 saving in the power consumption necessary to mould satisfactory products, although thin-walled articles and Perspex require high pressure injection even after pre-plasticization.

In the ensuing discussion, the author was of the opinion that in-line pre-plasticizers were better than those of the inclined plunger or extruder types. Although nylon had been successfully injection moulded by a machine incorporating a pre-plasticizer in the U.S.A., it had not yet been tried in Great Britain.

THE SIGNIFICANCE OF INJECTION RATE IN MOULDING

By *L. W. Meyer and L. E. Tallman, Dow Chemical Co.*

INJECTION moulding in which the rate of injection exceeds 1,000 cu. in. per minute possesses many advantages, many of which may be ascribed to the more uniform flow characteristics of the material. In order to obtain high injection rates, a pre-plasticizer should be used so that even materials of high s.p. can be satisfactorily injected without excessive pressure drop occurring in the cylinder. The authors showed how the pressure drop in the cylinder rises drastically with increased injection pressure. Thus, pre-heating combined with a high rate of injection may be accomplished with minimal pressure drop in the cylinder. This results in products of improved strength properties and surface finish, at a faster rate. It is essential that the exact amount of feed be allowed into the mould. Should the injection charge exceed this amount, mould deformation occurs which may be appreciable before " flashing " appears. With due regard to these factors, it has been possible to mould thin-walled articles satisfactorily.

A STUDY OF INJECTION MOULDING OF TOUGHENED POLYSTYRENE

By *G. Hulse and A. Z. Borucka, Monsanto Chemicals, Ltd.*
(Read by *G. Hulse.*)

THE aim of the work described in this paper was to determine the effect of varying the conditions during injection moulding on the

strength properties of toughened polystyrene (Lustrex T3) in the form of rectangular test pieces. When the polymer is forced into the mould, the molecules become orientated. If the mould is cooled immediately, this orientation is frozen in. On the other hand, if the polymer remains hot in the mould for an appreciable time, molecular relaxation occurs and the orientation disappears. The extent of anisotropy can then be assessed by heating the test piece above its 2nd order transition point and measuring the amount of shrinkage which occurs. In addition to shrinkage measurements, modified procedures were developed to measure flexural strength and impact strength. It was found that variations of injection pressure do not affect the extent of orientation, as measured by shrinkage. Shrinkage, and therefore orientation, was found to increase with lower injection temperature and with reduced thickness of test piece. Shrinkage *v* temperature and flexural strength *v* temperature curves were strikingly similar, which suggested very strongly that flexural strength is partly determined by orientation effects. Moreover, by plotting these relationships graphically it could be shown that the following equations were obeyed:

$$F = A_f.\exp K_f/T$$

and $$S = A_s.\exp K_s/T$$

where F and S are flexural strength and shrinkage, respectively, A_f, K_f, A_s, K_s are empirical constants and T is the temperature. These results show how these properties may be empirically related to moulding conditions.

For thicker mouldings (ca. ¼ in.), impact strength increases with lower temperature. The reason for this is unknown at present although it is believed not to be due to orientation effects because shrinkage does not behave similarly. The impact strength is found to drop enormously when the chisel type of weight is replaced by a ball bearing type. This illustrates the importance of orientation effects in such measurements.

By constructing stress-strain curves for deformation tests it is possible to measure the energy absorbed during deformation. Results of such tests showed that the energy absorption was linearly related to impact strength. This suggests that a single non-destructive measurement of stress *v* strain can provide information concerning impact strength.

RECENT DEVELOPMENTS IN FLUORINE POLYMERS

By *G. W. Bowley, I.C.I. Ltd., Plastics Division.*

THE present contribution reviewed some of the more recent advances in fluorine polymers and copolymers. The most outstanding advantages of these materials are their extreme chemical resistance, excellent electrical properties and non-inflammability. On the other hand, their high specific gravity combines with their high cost to render them economic for special purposes only. Although polytetrafluorethylene and polychlorotrifluoroethylene were developed during the last war and commercialized soon after, p.t.f.e. has become the more widely used, and its low friction properties are now well known. However, it cannot be processed in the normal way since it does not melt without decomposition and, in order to overcome this defect, copolymers of chlorotrifluoroethylene and vinylidene fluoride have been made. Dupont have recently announced the production of a copolymer of tetrafluoroethylene and perfluoropropylene which, it is claimed, does not decompose at processing temperatures. These materials hold great promise for the future. P.c.t.f.e. is now commercially available and p.c.t.f.e./vinylidine fluoride copolymer may be used to give pinpoint free protective layers. This copolymer is also resistant to gamma-rays and may be used for enclosing surgical goods for gamma-ray sterilization.

P.t.f.e. is available in granular, paste and dispersed form. The granular polymer is available over a range varying from a large, soft, hairy particle to a hard, spherical particle. The physical properties of the soft type are better than those of the hard variety. Improved tensile strength and elongation at break are readily obtained by pre-heating the polymer to 150–300° C., before moulding or extruding. The author presented illustrations showing how high pressure processing (3 tons per sq. in.) resulted in a remarkable reduction in the number of voids and discontinuities in the products. It is now possible to produce p.t.f.e. foil (*ca.* 0.001 in. thick) having an elongation at break of 200–300%. Two methods of extrusion are in current use: the ram process (mainly in the U.S.A.) and the continuous, screw process as developed by I.C.I. in this country. The author then demonstrated a p.t.f.e. covered wire, possessing high flexibility, which had been developed for the first time anywhere by the screw extrusion process. Such a product should be of interest to the cable industry.

P.t.f.e. dispersions are now available in two forms, (*a*) a paste polymer specifically designed for extrusion, and (*b*) a general purpose dipping and coating dispersion. The latter is recommended for very thin coatings on wire so as to avoid cracking during flexing. The paste polymer, containing a lubricant, is premoulded by extrusion through a cold die followed by passage through an oven to remove the lubricant. The polymer then passes through two sintering ovens in series. A plant has recently gone into production producing tubing, rod, tape and covered wire by this process. P.t.f.e. rod made by this process can be cold drawn to *ca* 400% elongation before breaking. The improved flexibility of the product permits its use as a protective sleeve for rubbery materials.

P.t.f.e. can now be bonded to metals by a surface treatment with a solution of sodium metal in liquid ammonia. This will facilitate the further development of the material for anti-friction purposes.

It has recently been discovered that the addition of a small amount (1 in 5,000) of polymer to molten steel acts as an excellent de-gassing agent. It is hoped that this will provide a growing outlet for scrap material. The author concluded his paper by mentioning that world production of p.t.f.e. is approximately 2,000 tons per annum and is steadily increasing as it becomes more widely used.

In the ensuing discussion, the author made the following points: (*a*) the sintering process should be carried out in air since vacuum sintering resulted in discoloration, (*b*) it is possible to extrude both granular and paste polymer admixed with fillers, and (*c*) the low temperature properties of flexible p.t.f.e. are remarkable, flexibility being maintained down to liquid nitrogen temperatures.

RECENT DEVELOPMENTS IN ARC-RESISTANT THERMOSETTING MOULDING MATERIALS

By *J. Hofton and C. P. Vale, B.I.P. Chemicals, Ltd.*

(Read by *C. P. Vale.*)

THE first mineral filled moulding material appeared in 1944, but it has been only during the last few years that alkyd moulding materials and asbestos filled melamine-formaldehyde (MF) resins have appeared on the market. The low water content of MF resins results in low shrinkage during cure, yet the product possesses poor strength properties. Strength may be improved at the expense of electrical properties by the addition of nylon or cellulose fibre as fillers. The incorporation of asbestos fibre gives improved strength properties, but the presence of magnetite in the asbestos introduces a severe electrical disadvantage. Glass fibre is, therefore, preferred as a filler, although alkali glass is to be avoided since it retards cure.

Certain physical properties were then listed for a series of products based upon asbestos, glass, asbestos-glass mixtures and nylon fibres used in conjunction with MF and polyester resins. In general, long-fibre fillers gave rise to high impact strength products while short-fibre products were of low impact strength. In most cases, shrinkage during cure was less than 5%; the optimum time of cure was found to be temperature independent for polyester resins between 132° and 166° C., but strongly temperature dependent for MF resins over the same temperature range. Results of shrinkage tests at 100° C. over periods of up to 20 days showed that glass/polyester (1% shrinkage) were superior to asbestos/MF (5% shrinkage) and nylon/MF (14% shrinkage).

The effect of dry heat ageing (150°–200° C.) was investigated on moulded test-pieces by means of measurements of cross-breakage strength, volume resistivity, power factor and dielectric constant. In general, irrespective of fibre length, nylon/MF resins showed a loss of *ca* 90% strength after 500 hours ageing. Glass/MF resins lost *ca* 50% while asbestos/MF resins lost only *ca* 15% of their cross-breakage strength. Although the glass filled products age more than their asbestos filled counterparts, the initial strength of the former were much higher than those of the latter. As a result, the actual strength of both types—after ageing—were of the same order. Changes in volume resistivity were slight after heat ageing, and both power factor and dielectric constant showed slight improvement. With the exception of nylon, which deteriorated appreciably, heat ageing had negligible effect on the tracking properties.

In summarizing, the author stated that, provided they were pre-heated at 90°–100° C. to avoid steam-blistering, MF resins exhibited satisfactory ageing properties. The inferior ageing properties of glass/MF resins may be due to bad adhesion at the resin/glass interface.

RELATIVE MERITS OF EPOXIDE, PHENOLIC AND POLYESTER RESINS IN GLASS REINFORCED PLASTICS

By *L. H. Vaughan, Bakelite, Ltd.*

THE author described his paper as a critical examination of the relative merits of epoxides, low-pressure phenolics and polyester resins as binding agents for filaments and fibres

in reinforced plastics. After a brief description of the chemistry of their production, the physical characteristics of the resins were compared from the point of view of their toxicity, the properties of cured but unfilled resins and their production costs. Epoxide resins are the most expensive. Phenolic resins are cured at temperatures below 130° C.; no catalyst is necessary and the impregnated resin possesses good shelf-life before cure. Polyesters may be cured at either low or high temperatures as may the epoxides. A typical catalyst for the low temperature cure of an epoxide is diethylene triamine while acid anhydrides and aromatic diamines are used at high temperature.

Since phenolics cannot be cast, epoxides and polyesters are used for this purpose. The epoxides are characterized by good adhesion and low shrinkage properties. By a judicious choice of hardener, the cure may be moderated so that heat liberation is not excessive. Fillers help in this respect and reduce even further the low shrinkage.

For the production of laminates, epoxides give better results than polyesters due to their better adhesion properties towards glass cloth. They possess superior flexural strength but lower impact strength; nevertheless polyesters are widely used since they are cheaper, and may be made heat resistant by using chlorinated compounds in their synthesis. The author suggested that the lower impact strength of the epoxides is due to their good adhesion to glass, thereby preventing slippage along the glass fibre. The flexural strength properties of polyester products may be improved by applying a size of the silicone or chromium-acrylate type to the fabric but this improvement is not maintained after ageing at 200°C. Phenolic laminates may be vastly improved mechanically by mild, low temperature cure followed by several 24 hr. cures at increasing temperatures. The author emphasized the results of previous workers on fatigue tests applied to flexural strength. A fall to 25% of the initial value being commonly found after 10^7 flexes. Attempts to improve fatigue performance by the addition of up to 33% of aluminium silicate were unsuccessful. The replacement of glass fabric by glass mat showed flexural fatigue strengths to be in the following order: epoxide> polyester> phenolic. A word of caution was necessary, as a safety factor for specification purposes, owing to the irreproducibility of finishing technique, resin and glass filler. Laminate strength decreases with increased temperature for all resins. Immersion tests in water at 25° C. showed similar behaviour for all resins after 1,000 hr. After the same time at 60° C., polyester and epoxide resins were superior to phenolics.

There is an increasing demand for higher chemical resistance properties in resin laminates. The operative factor in this respect is the protection afforded to the glass-fibre by the resin. Thus, although unfilled resins show similar chemical resistance, the epoxides give better chemical protection to the fibre as a result of their better adhesion, consequently the chemical resistance of the filled resin is superior. Flame resistance properties are becoming more important and these may be improved by the addition of antimony oxide, chlorinated diphenyl and chlorinated waxes, but these result in reduced strength properties. By using chlorinated fatty acids in the production of polyester resins, excellent results have been obtained. When used together with a few per cent of antimony oxide, the polyester laminates are fireproof.

REINFORCED PLASTICS FOR EFFICIENT STRUCTURES

By *W. A. Baker, Bristol Aircraft, Ltd.*

THE aim of this paper was to draw the attention of plastics manufacturers and technologists to the great potentialities awaiting their products in car, ship, railway and aircraft production. Before wider application can be made of reinforced plastics in these fields, however, it is essential that greater attention be paid to material specification. When materials can be guaranteed to come up to a specification, the demand will increase as confidence grows. Such specification must be laid down and adhered to. As an example, if a particular property shows a coefficient of variability of 20% an aircraft designer is bound to work to a safety factor of 3.0. With a coefficient of 5%, the safety factor may be reduced to 1.15. Such a reduction will result in greater simplification and reduced costs. This in itself would constitute a great advance. Attention to this is even more important than achieving comparatively minor improvements in the properties of established materials.

Two of the most important properties required of aircraft structures are good weathering features and high temperature performance. The weathering properties of asbestos/phenolics are better than those of glass/polyesters. However, the latter may be improved by ensuring that the glass-fibre is well sized and the unit well cured. Crazing of the product may not reduce the strength but will certainly affect the weathering properties of the unit. In this respect, epoxides are superior to polyesters. The crazing that occurs with polyester laminates appears almost with the first strain cycle. It may be considerably reduced, however, by the addition of small amounts of plasticizer. The high temperature performance of epoxide and polyester laminates were illustrated in a diagram showing the specific strength of these materials after exposure for 200 hrs. at temperatures varying from 25° to 250° C. Epoxides were superior to polyester laminates below 200° C. but this order was reversed above this temperature. Pre-impregnated glass cloth can be press moulded with good results for 20 min. at 150° C., provided the press pressure is not so high as to crush the fibre. Alternatively, autoclave moulding may be used by passing the loaded tool into a hot air autoclave and curing under pressure. Where small or large high quality mouldings are required, injection moulding may be successfully used. The resin is injected into layers of the reinforcing fibre which is held in a mould. Radar domes have been produced this way, and a machine is now being built in Bristol to take boat shells and other products of this kind. The author showed an illustration of a mechanical winding device, consisting of a rotating mandrel with a flying shuttle arrangement, with which it is possible to construct resin-impregnated glass fibre tubes.

Among the products which have been successfully produced from reinforced plastics, are (*a*) a glass fibre bottle, (*b*) helicopter cooling-fan blades made of glass fibre/polyester laminates; the advantages being fatigue elimination and less weight, (*c*) gun-shields on ships, resulting in no corrosion and less weight, (*d*) a high speed radar scanner, coated with aluminium alloy foil for electrical conduction purposes; the accuracy necessary for this article precluded its manufacture from metal, and (*e*) plastic drop tanks of asbestos/phenolic laminate.

The superstructure of ships now require enormous maintenance attention. So much so, that rather than keep the vessel in running order, it is preferable to lay it up. This procedure reduces considerably the effective lifetime of the vessel. By extending the use of reinforced resin products in ship superstructures, it should be possible to extend enormously the present lifetime of a vessel. Rust and fatigue are ever present problems in railway coach and car maintenance, and the wider use of reinforced plastics may resolve this problem in the near future.

In reply to a question, the author stated that reinforced silicone resins are superior to epoxide and polyester resins at temperatures *ca* 300° C. Unfortunately, this was not true at lower temperatures.

The stand of "Plastics" at the Exhibition.

New Productions

American Compass

Taylor's new navigator compass provides fully compensated, easy-to-read compass directions for sailors or drivers. A model of clean, functional styling, this compass is housed in a lustrous grey case moulded of Tenite butyrate plastic. Its compass card, moulded of black butyrate and marked in white, can be easily read through the clear dome. The instrument is mounted on an adjustable bracket which fits easily into any position on boat or car.

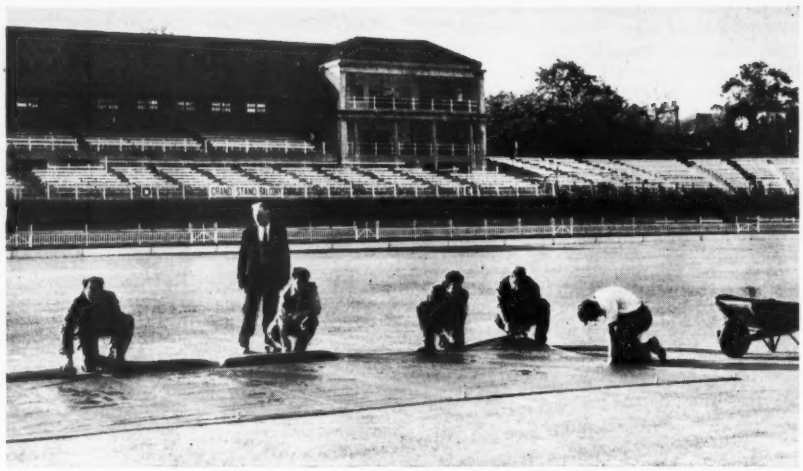
Inside the liquid-filled dome, the dial tilts 20° without binding and gives smooth, steady indication. On top it has a compass rose for navigating convenience and for taking bearings.

Self-illuminated by dry cell, the unit requires no wiring. A push button on the case lights the dial at night. Two recessed screws on the bottom of the case may be turned to adjust the compensation magnets. For this purpose, the manufacturer, Taylor Instrument Compasses, 95 Ames Street, Rochester 1, N.Y., packages a special screwdriver tool with each compass. The case is moulded by Nosco Plastics Inc., 1701 Gaskell Ave., Erie 6, Pennsylvania, U.S.A.

Compass with butyrate case.

Closures in Polystyrene

Erinoid grade C.P.20/H.S. high impact, heat resistant polystyrene, manufactured by Styrene Products Ltd., is used for these new Tru-Seal screw caps and stoppers by Containers & Closures Ltd. The use of this material enables a number of bright colours to be used, the closures can withstand temperatures up to 180° F. without change in structure or strength and the material has a strength four times greater than the plastics material used previously. In addition, polystyrene is entirely non-absorbent, giving bacteria-free closures.



Nylon coated p.v.c. being tried out as a wicket cover at Lord's. The cover measures 24 yds. × 4 yds. and only weighs 45 lbs.

Lightweight Low Loss Batteries

The combined virtues of extremely light weight, unspillability, and very low open circuit losses distinguish two new batteries recently introduced by Chloride Batteries Limited, Exide Works, Swinton, Manchester. They are the 6-MNA17 and 4-MNB17 units—each with a capacity of 4 Ah at 12 volts and 8 volts respectively.

Their design includes many novel features with an important bearing on performance. The cells are assembled in tough containers of translucent high impact polystyrene. The battery covers are one-piece mouldings of the same material, obviating the need for individual cell lids. They are cemented to the containers by a special process which ensures a reliable and leak-proof joint.

Inter-cell, inter-row and end terminal connections are made by passing lead alloy connectors through leak-proof joints in the cell walls. External connections are insulated against accidental short circuits by polythene covers and protected from damage by raised shields on the container moulding.

Within each cell, positive and negative plates are separated by sheets of Porvic, a microporous plastic material. The 6-MNA17 battery also has sheets of resin-bonded glass wool against the positive plates as protection from the effects of vibration frequently encountered in service.

Tobacco Pack and 1-oz. Jar

Godfrey Phillips are now marketing their "Grand Cut" pipe tobacco in a new type of tobacco pack created as a result of close co-operation between their Research Department and that of The Metal Box Company Ltd.

It is a pouch made from Tripolam D—a lamination of paper and aluminium foil coated with a plastic.

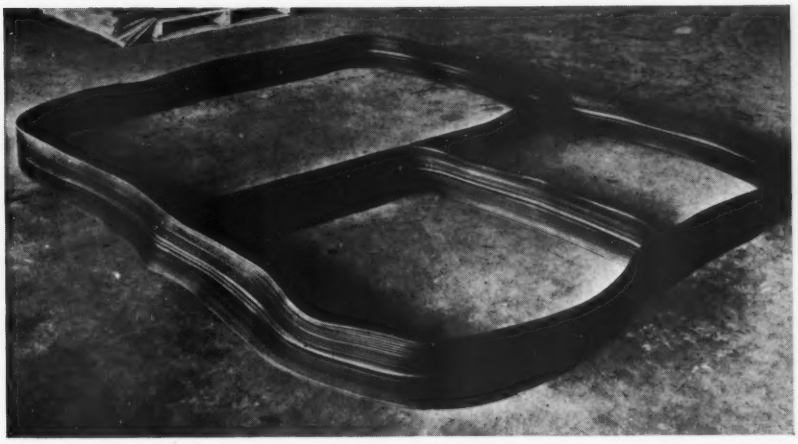
The pouch, which holds an ounce, is vacuum-sealed after filling to keep the tobacco factory-fresh.

The Metal Box Company is also now producing small transparent polystyrene 1-oz. jars. They have a crystal-clear appearance, and are made to nest three small nibs immediately under the neck ring preventing the jars from sticking together when stacked inside each other. They can be sealed with a polythene snap-on cap, which may be printed, if required, in one colour.

(Above) Moulded polystyrene bottle closures.

(Right) Laminated tobacco pack and moulded polystyrene 1 oz. jar and polythene lid.

The expansion joint in position.



(Above) The pre-fabricated p.v.c. concrete expansion joint.

Pre-fabricated p.v.c. Watertight Joint

These joints (overall dimensions 9 ft. 6 in. × 8 ft. 4 in.) were pre-fabricated by The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17, from standard rolls of 9 in. wide Durajoint strip and despatched to site as work progressed, for use between the sections of a triple closed concrete culvert. They were supplied to the Mitchell Construction Co., main civil engineering contractors for the building work at Little Barford "B" Power Station at St. Neots, Huntingdonshire.

Seventeen units have been supplied and the illustrations show their use in the construction of the culvert.

One of the great advantages of Durajoint which is extruded p.v.c., is the ease with which the material can be welded into any required form. Joints can be made on site with simple tools, or pre-fabricated whichever is most convenient.

New Car with Reinforced Plastics Body

The production of a new low priced family car is announced by Coronet Cars Limited (66 Oxford Road, Denham, Bucks). The car, which is named the "Coronet," is British throughout having been designed and built entirely in this country.

It is the first three-wheeler to be powered by the recently introduced 328 c.c. Excelsior twin-cylinder blast-cooled two-stroke engine which drives a single rear wheel.

Cellobond polyester resin and glass fibre is used throughout for the body which is made in two main mouldings on ultra modern sports-car lines. Each side of the body contains a 35-in. wide door hinged, at the front on strutted and gusseted steel supports moulded into the body and bolted securely to the chassis members. The seat width is 47 in. and it will carry three persons abreast. The dash is also moulded in polyester/glass fibre and carries a panel in which is mounted the speedometer, light switches, etc. Recessed into the body at the front is a pair of double-dipping combination headlamps and at the rear there are twin rear lamps-cum-stop lamps, and a number plate lamp. A lift up lid, fitted with a lock, gives access to the engine compartment and the separate luggage boot. A special tray provides additional luggage space behind the seat back, whilst a shelf in the dash and door pockets offer further parcel facilities.

A hood and side screens are provided as standard equipment. These render the car completely weatherproof. The upholstery is in Geon p.v.c. leathercloth.

The Gillette razor display, showing the injection moulded polystyrene cases.

Dispenser Display Unit

The Gillette Superspeed Trio is a new range of razors which vary in weight and in angle and exposure of the blade.

Each razor is distinguished by the colour of the base of the handle, which matches the polystyrene case.

The case, which is produced by Gillette's own plastic department, has a base of opaque coloured polystyrene with a transparent polystyrene top. It incorporates several interesting features. When the lid is raised, an extension of the lid at the back of the case lifts up the razor blades dispenser in its compartment so that the user can remove it without fumbling. The lid springs open when the curved front panel is pressed.

Particularly interesting is the shape of the moulded case at the back which has been designed to slide over the rigid wire part of the display unit. This holds the case firmly in position without its being obscured by any part of the display unit.

The Coronet which has a glass reinforced polyester resin body.

Plastics News

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes and Meetings.

NEW BURSGREEN BANDSAW (B.&B.).—Wadkin Ltd. of Green Lane Works, Leicester, have recently introduced into their Bursgreen range of machines a 24 in. Bandsaw, known as the BZB. Robustly built and well engineered on sound principles, the inclusion of many unique design features has resulted in smooth, vibrationless, free running machine.

The interchangeable aluminium alloy saw pulleys are accurately machined and balanced, and have vulcanized-on rubber tyres and are fitted with sealed type ball bearings, which require no lubrication. Correct tension and tracking of the blade is obtained by separate handwheels on a spring loaded slide. An adjustable brush in contact with the bottom pulley keeps the tyre free from sawdust, and both pulleys can be brought to rest by a lever-operated brake.

General

Hand Operated Toggle Press.—For industries which require a small pressure tool capable of undertaking a wide variety of tasks, the Besco hand operated toggle press Model PER/1 has been developed by F. J. Edwards Ltd., of 359-361 Euston Road, London, N.W.1.

The Bursgreen bandsaw.

The press, weighs 86 lb. and exerts a pressure of 1,320 lb. It has an operational range which includes the experimental moulding of plastic materials in laboratories and workshops, when fitted with electrically heated tools. Made for bench mounting, the press is constructed of cast iron, with a steel ram, link and long handle within a cast iron ram head. The 7 in. × 7 in. work table, is machined and bored central to the ram and drilled with two holes on either side. The throat depth is 4⅜ in. and the table hole size is ¾ in. diameter.

The machine has a fixed stroke of 1⅝ in. The ram head is fitted in a groove in the main frame and has a 4½ in. vertical adjustment which is carried out by means of a screw within the head. The head itself is locked in position by means of a bolt running through the main frame.

A New Bench Mounted Nut Runner.—For repetition nut running to a pre-determined torque the Consolidated Pneumatic Tool Company are now supplying the 3017 "Power Vane" drill fitted to a light bench stand, complete with foot operated control and reducing valve.

This unit has been developed from a standard C.P. tool for use in light assembly work where many thousands of nuts are required to run up. The high power rating allows the torque figure to be reached without using the maximum power of the tool, the exact degree of tightness to which nuts are set being ensured by the operation of the reducing valve.

The assembly is suitable for all nuts up to ⅜ in. bolt size, according to nature of the work required.

Abrasive Finishing.—Taylor Tools & Supplies Ltd., Broadheath, Altrincham, have developed and put on to the British market a new machine for abrasive finishing on large flat surfaces.

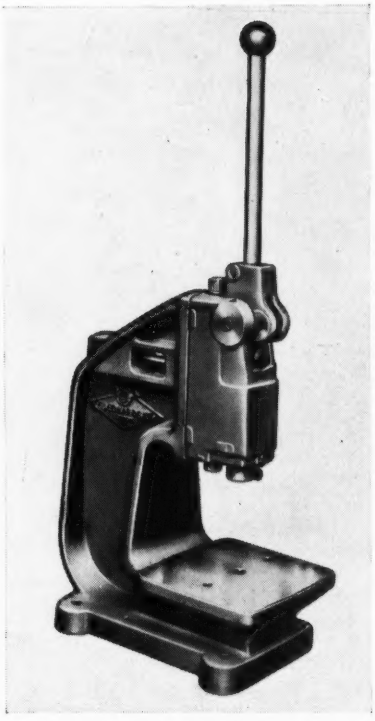
It will operate quickly and efficiently on metal, plastic or wood and is economical and efficient on abrasives paper belts, the least expensive type. If necessary, a belt can be changed in less than a minute.

The table surface of the machine is 36 in. × 36 in. It will polish the full width, and lengths greater than the table can be accommodated by moving the work piece on the table.

It is of very sturdy and robust construction and the contact roll or pad is supported on a rigid bridge and traversed by air-hydraulic mechanism, giving an infinitely variable speed. The table feed is automatic and the contact pressure can be varied to suit the materials being processed and the finish required.

The machine can be operated with electro-magnetic clamping or can be used with other types of securing mechanism as required.

Roll Cladding.—A new method for the external cladding of rolls, shafts, tubes and drums with stainless steel is now in production at the Hull Works of Rose, Downs & Thompson Ltd. This patented process, which has been fully proved on the Continent, overcomes the difficulties encountered in other methods in that a perfect bond is obtained between the cladding and the foundation body.



The Besco hand-operated toggle press.

The cladding process is particularly advantageous in the case of internally heated or cooled rolls and drums which, after cladding, are suitable for working in a very wide range of temperatures. The clad rolls can also be ground and polished to precision limits.

While stainless steel is the most usual cladding material, the process can be applied equally successfully to other similar materials.

Results already obtained indicate that this method of roll cladding will be of great benefit to a large number of industries.

A leaflet describing the roll cladding process, its applications and advantages, can be obtained from Rose, Downs & Thompson Ltd., Hull.

Literature

Expanding Agent for Epoxy Resins.—Genitrol N developed by Whiffen & Sons Ltd., Fison House, 95 Wigmore Street, London, W.1, is an agent used in the production of expanded epoxy resins. It allows the resin to be expanded with minimum exotherm and at temperatures of the order of 60° C. Full details and formulations are given in a booklet.

Irradiated Polythene Tape.—A technical report on progress made in the production of irradiated polythene tape has been issued by Tube Investments Ltd., The Adelphi, London, W.C.2.

Unplasticized P.V.C. Compounds.—British Geon Ltd., Devonshire House, Piccadilly, London, W.1, have produced an information

sheet on their unplasticized p.v.c. compounds for pipe manufacture.

Hexagon Digest published by the Dyestuffs Division of I.C.I. Ltd., contains articles on The Dyeing of Cellulosic Fibres with Procion Dyestuffs, Colorimetry and Colour Reproduction, and A Work Integrator for use with the Cambridge Fibre Extensometer.

Rotary High Vacuum Pumps forms the subject of a booklet by Edwards High Vacuum Ltd., Manor Royal, Crawley, Sussex.

Chemicals for Industry, prepared by Robinson Bros. Ltd., Ryders Green, West Bromwich, contains a brief description of the many chemicals they manufacture.

Silicone Mould Release Agents.—A booklet on this application of silicones has been published by I.C.I. Ltd., Nobel Division.

Phenolic Moulding Compounds.—British Resin Products Ltd. have prepared comprehensive data sheets on their range of Rockite phenolic moulding compounds. Copies can be obtained from this company at Devonshire House, Piccadilly, London, W.1.

Russian Translations.—Translations of technical articles appearing in Russian journals now available from Dept. of Scientific and Industrial Research, Lending Library Unit, 20 Chester Terrace, Regents Park, London, N.W.1, include: " On the kinetics of phenol formaldehyde resin solidification with the aid of hexamethylene-tetramine." (T.C.L.97).—" Kinetics and mechanism of polymerization initiated by redox system II. Polymerization in aqueous solutions in presence of certain redox systems." (T.C.L.94).—" The polymerization of propylene in the presence of phosphoric acids containing fluorine and boron trifluoride " (T.C.L.96).—" The polymerization of isobutylene in the presence of triethyl aluminium and titanium tetrachloride " (C.T.S.330).

Electrical Resistance Thermometers is the title of a booklet issued by Foster Instrument Co. Ltd., Letchworth, Herts.

Organic Chemicals. A list of some 3,500 organic chemicals is contained in a catalogue published by Distillation Products Industries which is a division of the Eastman Kodak Company. Most of these chemicals can be obtained from Kodak Ltd., Kirkly Trading Estate, Nr. Liverpool.

Unpublished Reports.—Copies of the following reports can be obtained from the Department of Scientific and Industrial Research, Lending Library Unit, 20 Chester Terrace, Regents Park, London, N.W.1.

Alkyd Resins for Vinyl Finishes. Part II Atmospheric Resistance. PB.111824. Atmospheric weathering tests were made on vinyl coatings made with alkyd resins containing varying percentages of phthalic anhydride, different fatty acids and polyhydric alcohols, also on Epon and several Epon esters.

Development of Vibrating Reed Technique for Measuring Properties of Polymers.—PB.118600. The mechanical properties of viso-elastic materials such as plastics or propellents at very high or very low rates of loading can be determined by an electro-mechanical vibrator, the relevant motions being measured electrically.

Development of an Organic Lacquer Resistant to Fuming Nitric Acid.—TIDU 4667. This work concerned the development of a protective coating and sealant for the metal surfaces in an acid tank. Research on the modification of KEL-F through copolymerization with vinylidene fluoride ultimately led to the development of Kellog X-200 resin. Laboratory tests indicate that coating systems of X-200 resin. Laboratory tests indicate that coating systems of X-200 filleting material and X-200 lacquer are adequate for the intended application.

Reinforcement of Silicone Rubber with Carbon Black.—PB.121231. The report describes the filling of silicone polymer, Linde W-96, with various carbon blacks, in order to cure it into a firm, well-reinforced rubber.

Development of High-Temperature Oil-Resistant Rubber.—PB.121195. The report describes research to develop two types of rubber composition.

Development of Electrically Conductive Transparent Coatings for Acrylic Plastic.—PB.121208. The report describes the adaptation of the Marklad process, to the application of transparent static-dissipating coatings to acrylic plastic, including curved surfaces such as occur in aircraft canopies.

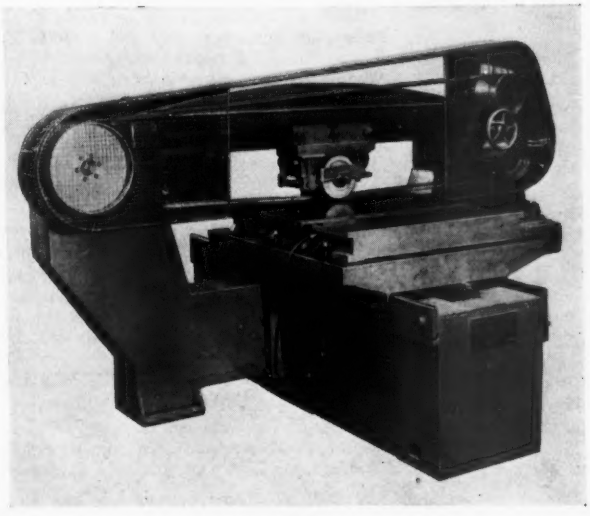
Effects of Moulding Pressure on the Strength Properties of Several Types of Glass Fibre Reinforced Plastics.—PB.121196. The report describes work carried out on the mechanical properties of laminates fabricated from a polyester resin reinforced with woven glass fabric or with 2 oz. or 8 oz. unoriented glass fibre mat. The laminates were fabricated in an open mould, at moulding pressures of 1, 10 and 100 lb./sq. in., and in a closed mould at 10, 100 and 500 lb./sq. in. Results indicate that the properties of laminates fabricated in the closed mould do not vary appreciably with changes in moulding pressure. However, the flexural and tensile properties of panels moulded in the open mould increase as the pressure increases from 1 to 10 lb./sq. in., but do not change appreciably at higher moulding pressures. Compressive strength shows a tendency to decrease with increasing moulding pressure.

Mr. A. J. Warner recently appointed director of research for Mycalex Corporation of America.

Investigation of Thermal Properties of Plastic Laminates, Cores and Sandwich Panels.—121191. A description is given of measurements of specific heat, thermal conductivity, and coefficient of linear expansion, for several materials. The apparatus used, and procedure adopted is described in detail for each of the measurements.

Teflon.—PB.121286. The study described was made to determine the suitability of Teflon as a preservative for long-term storage of weapons and as a lubricant for weapons, the results may be of interest in the fields of industrial corrosion prevention and lubrication. Details of tests are given and results may be of interest in the fields of industrial corrosion prevention and lubrication. Details of tests are given and results are summarized. Information is included also on weathering and storage. An appendix describes the technique of applying thin films of Teflon to metals.

The Effects of Radiation on Organopolysiloxanes is the title of the most recent publication issued by Midland Silicones Limited, 19 Upper Brook Street, London, W.1, in their series of Silicone Notes. The publication is divided into major sections, one of which deals with the use of irradiation techniques for curing polymers, whilst the other describes the ageing effects of radiation on conventionally cured silicone products.



A new machine developed by Taylor Tools & Supplies Ltd. for abrasive finishing on large flat surfaces.

Company News

Plastic Filters Ltd. have moved to new premises at Chapel Works, Park Terrace East, Horsham, Sussex. Telephone number, Horsham 3075.

Extended Technical Service Laboratories.—A major extension and re-equipment programme for the Universal Metal Products Ltd. laboratories has recently been completed. The new laboratories were planned to keep pace with the increased growth of the scientific side of packaging and to meet the ever-increasing demands on the Technical Service Laboratory, which carries out customer service work for both the Metals and Plastics Divisions of the company.

The new department comprises three main laboratories, namely Works Control, Surface Coating Materials, and Technical Service and Development Laboratories. Each laboratory is further divided into sections, each of which, generally speaking, follows its own individual line of work independently, although quite often two or three sections will be working on the same problem simultaneously, each dealing with a specialist aspect of the particular line of investigation.

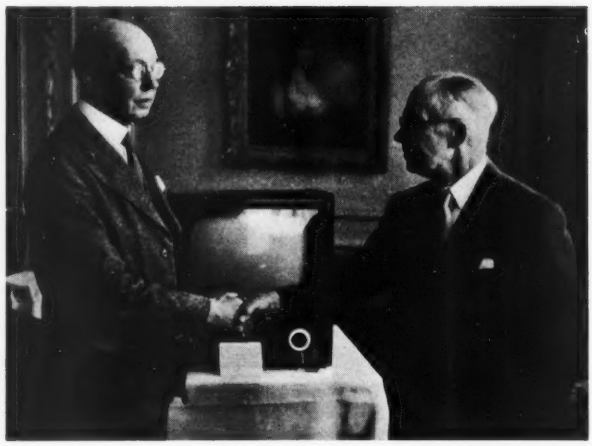
Amongst the present activities of this section may be mentioned plastic packaging. As both plastic moulders and manufacturers of collapsible tubes and rigid containers, U.M.P. are naturally concerned with the use of plastics for packaging and one line of development is concentrated on a new type of plastic container. This development is new in the true sense of the word in that the method of production involved employs quite novel principles and the thermoplastics envisaged for use are new polymers which have specific properties for packaging applications.

New laboratory equipment, including radio frequency heating sets, has been installed for this project.

D.S.I.R. Document Unit.—The documents section of the Technical Information and Documents Unit (T.I.D.U.) has now been merged with the Lending Library Unit and operates from Department of Scientific and Industrial Research, 20 Chester Terrace, Regents Park, London, N.W.1.

All future requests for the loan of documents referred to in T.I.D.U. Unpublished Report summaries should be addressed to this unit. Requests for photoreproductions of these reports, and of German documents, should also be sent here.

Mr. H. J. Sephton, London branch manager of Alfred Herbert Ltd.



Mr. H. V. Potter, Chairman of Bakelite Ltd., presenting a television set from his fellow directors to Mr. W. E. Cooper on his retirement after 35 years association with the company.

Documents which were issued on loan by T.I.D.U. from Cunard Building should be returned to this address.

Startrite Sales Ltd., Waterside Works, Gad's Hill, Gillingham, Kent, have been appointed sole selling agents in the U.K. for the Ideal butt welder which is manufactured in Germany.

E. K. Cole Ltd.—Net profit for the group after providing for depreciation and taxation and bringing in £61,000 taxation reserve made in previous years is £359,074 compared with £328,733 for last year. A final dividend of 10% making a total of 17½% is proposed.

Courtaulds Ltd.—A net profit of £7,357,328 has been declared by Courtaulds Ltd. for the year ended March 31, 1957. This is approximately £1,600,000 below the figure for last year but the final dividend of 6% giving a total of 10% is the same.

Imperial Chemical Industries Ltd. are seeking permission from Gloucestershire County Council to develop a site of 1,000 acres on the Severn in the Thornbury Rural District for the manufacture of organic and inorganic chemicals. If permission is granted, the total amount invested in developing the site between now and the mid-1970's may well be of the order of £100 million.

Whiffen & Sons Ltd.—In the "Exhibition Preview" the address of this company was reported incorrectly. The correct address is Fison House, 95 Wigmore Street, London, W.1.

Personal

Mr. M. Seaman has, from July 1, moved from the Board of British Oxygen Engineering Limited to the Board of British Oxygen Gases Limited, where he will be Director responsible for equipment manufacture.

Mr. H. J. Sephton has been appointed London Branch Manager of Alfred Herbert Ltd., 70 Vauxhall Bridge Road, S.W.1, in succession to Mr. William Core who is now Sales Director of the Company.

Mr. Robert Ritchie, northern manager of Klockner Moeller England Ltd., electrical control gear manufacturers, of Princes Buildings, Oxford Street, Manchester, has been appointed to the company's board as Technical Director.

Mr. G. S. Webster has been placed in charge of the Stoke-upon-Trent Sub-Office of The English Electric Company, where he will be responsible for the sale of all products.

Mr. Milton Marshall.—The Southern Areas Electric Corporation Limited announce that Mr. Milton Marshall has relinquished his appointment as general manager of its subsidiary Resinoid and Mica Products Limited.

Major W. I. Anderson died at his home on July 2. He joined the Board of The Micanite & Insulators Co., Ltd. in 1932 and had been Chairman since 1944. He was also Managing Director of Associated Insulation Products Ltd. and a Director of British Industrial Plastics Ltd.

Mr. Samuel W. McCune III, Eastern district sales manager of Du Pont's Elastomer Chemicals Department, has been named general sales manager of Du Pont Company (United Kingdom) Limited.

Mr. McCune will have his headquarters in London and will be responsible for the over-all sales activities of the new Du Pont subsidiary, now building a neoprene plant near Londonderry, Northern Ireland.

Mr. H. A. Luss has been appointed Chairman of the Nucleonius Group of the Scientific Instrument Manufacturers' Association. Mr. Luss, who is at present Joint Managing Director of Isotope Developments Limited, has also been appointed Deputy Chairman of the company.

Golf Results.—The results of the P.I.G.S. meeting at Wentworth Golf Club on June 25 were:—

"British Plastics" Trophy, winner: F. C. Pullen 70, runner-up: T. W. Fassett 74. "Over Fifties" Competition, winner: F. G. Montfort-Bebb 78, (after tie with H. E. Harden). "British Xylonite" Trophy, winners: S. D. Froud 37 points, G. F. Hunt 37 points, runners-up: R. P. Anderson 34 points, D. Sullivan 34 points.

Mr. A. J. Warner.—The appointment of Arthur J. Warner of Harlow, Essex, as Director of Research for Mycalex Corporation of America and associated companies has been announced by Jerome Taisholl, president. Mr. Warner will assume the responsibility for materials and product development in an expanded programme to be initiated by Mycalex Corporation of America in electronic components as well as glass-bonded mica and ceramoplastic insulation and synthetic mica.

Mr. I. D. Davidson, has been appointed to the Boards of the Shell Petroleum Company Limited and N. V. De Bataafsche Petroleum Maatschappij.

Automation Equipment

The I.D.L. Gamma Switch.—The Gamma Switch is a development in the application of nucleonics to the control of industrial processes. It is the first inexpensive and general purpose industrial device to be based on radiation detection.

As the name indicates, it is a switch rather than a precision measuring instrument. It consists of a Halogen quenched Geiger-Müller tube in circuit with a simple relay, built on to a printed circuit chassis and contained in a fire-proof or weather-proof cast alloy case. It connects to a normal mains supply, and its relay contacts can be wired direct into conventional control circuits. The relay operates when a predetermined intensity of gamma radiation is detected by the Geiger-Müller tube.

An example of a suitable application of the Gamma Switch is the control of high and low level of material in a hopper. A switch is mounted at the appropriate level outside the hopper, and a gamma ray source (suitably enclosed) is mounted on the opposite side. If the relay is set to trip when the radiation penetrating the hopper changes by the amount absorbed by the material in the hopper, a warning light or buzzer can be operated by the switch whenever the material passes the predetermined level. Alternatively, the switch can be connected to the device controlling the supply of material to the hopper, thus providing automatic control.

In a similar way the switch and detector can be mounted on each side of a conveyor or on a pipeline to signal any appreciable change of density in the fluid passing through.

Successful operation of the instrument is independent of the nature of the liquid or solid contained in the vessel or conveyor.

Isotopes Developments Ltd., Beenham Grange, Aldermaston Wharf, Nr. Reading, Berks.

Automatic Production Recorders.—The Autovisor provides a continuous and automatic record on one chart of up to 10 different machines or processes. The chart moves at a speed of 2 in. per hour and each machine operation or cycle is recorded on it by an electrically operated pen. By this means cycle times, machine performances, and tool outputs can be checked and a continuous record of production made. This provides a valuable guide in estimating for forward planning of work schedules.

The marking of the chart can be initiated by simple relays connected across motor terminals or by contact devices where this is more suitable. As well as recording the frequency of an operation the Autovisor will, of course, record its duration and, by incorporating a solenoid-operated counter in the circuit, a total production figure.

F. C. Robinson & Partners Ltd., Councillor Lane, Cheadle, Cheshire.

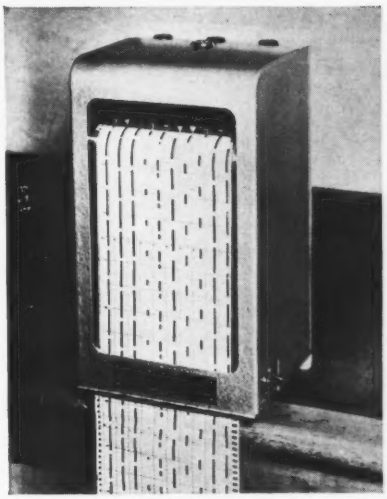
Weathering Device.—A new instrument designed for testing the fastness to light of dyestuffs and dyed materials, and also the effect of weather on textiles, colours, paint, varnish, paper, rubber flooring, synthetic materials, etc.

The source of radiation is a Xenon radiator, giving a radiation almost equivalent to daylight, surrounded by a double-wall cylindrical cuvette through which cooling water is passed. The cuvette is made of special filter glass, which limits the short-wave ultra-violet spectrum at a wavelength of 295 mu. Cooling is provided between the radiator and the cuvette by a strong air current.

John Godrich, 1 Princess Street, Manchester 2.

Torsional Vibration Pick-up.—This is a seismic type of pick-up which can be used to measure the amplitude of torsional oscillation or cyclic variation at the free end of a shaft.

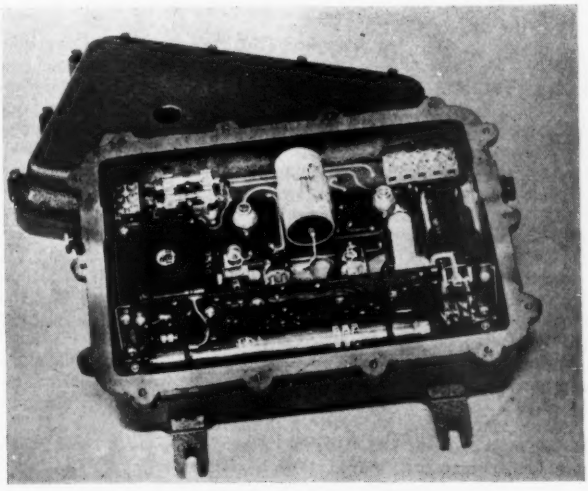
The pick-up contains a variable-inductance sensing element which detects the angular displacement between the fixing flange of the pick-up and a seismic inertia mounted within the unit. The system contains neither fluid nor springs, a permanent magnet being used to supply both the damping and restoring forces. No rubbing sliprings are employed to couple the unit to its stationary connecting cable and it can be used on shafts which are merely oscillating as well as on those which are rotating continuously. The pick-up can be calibrated when mounted in its test position, and accurately known sustained angular displacements of the seismic inertia can be made by means of the micrometer fixture provided. This enables an overall static calibration of the recording system to be achieved.

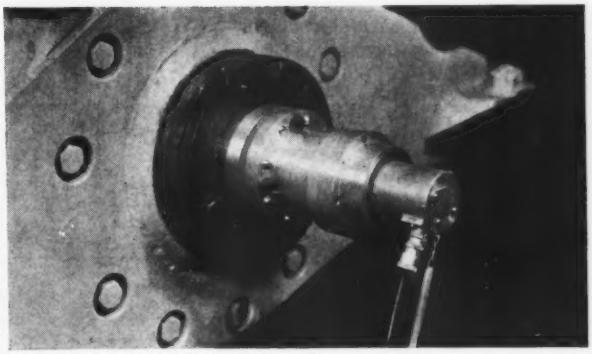


The R.O.I.V. Autovisor automatic production recorder.

At its maximum amplitude of $\pm 2°$, an output of approximately 10 volts peak is obtained from the MR220 F.M. pre-amplifier. The useful frequency range extends from approximately 5 c/s. upwards. The output of the pre-amplifier is directly proportional to amplitude of oscillation and may thus be applied to an oscillograph, analyzer or valve-voltmeter to enable accurate measurements to be made throughout the frequency range, without the need for integrating stages or calibration curves.

Southern Instruments Ltd., Frimley Road, Camberley, Surrey.



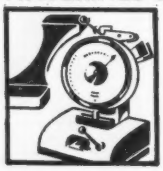


(Above) The G218 Torsional vibration pick-up.

(Left) The I.D.L. Gamma switch which employs a Geiger-Müller tube.

World's Industry Employs Plastics

MATERIALS and TESTING



"Vestolit S" p.v.c. suspension.—Of special interest in an account by Wick and König is the use of unplasticized "Vestolit S" p.v.c. suspension for the manufacture of water pipes. The authors point out that in a size commonly used for drinking water distribution, the plastic pipe is competitive with galvanized steel. It presents no corrosion hazard, is quite inert in the presence of water and offers no danger to health. Its mechanical properties are such that pipes made of the material are able to meet all the contingencies occurring in a water distribution network. A new method of obtaining a superior polished finish to the internal surface of the pipe by the use of an induction-heated mandrel during extrusion is referred to.
(*Kunststoffe*, 1957/June/299.)

Silicone rubber as an aid to the working of glass-fibre-reinforced polyester resins.—A useful practical account by Ferdinand Schäfer of the various applications of silicone rubbers in the working of glass-fibre-reinforced polyester resins. The use of this material to facilitate parting is considered and it is pointed out that although it gives excellent results with all polyester and epoxy resins, nevertheless styrene monomer in polyesters causes gradual deterioration of the silicone, thus the application of soap solution to the surface of silicone rubber as an additional safeguard is advised: 200 and 300 mouldings are then possible before surface breakdown begins. Moulds may also be made of silicone rubber and practical hints are given as to the best method of producing these. An interesting use of the same material is for the preparation of dies for the production of glass-fibre-reinforced extrusions (rods). The author concludes with a description of the production of hollow bodies by the contact method using inflatable silicone rubber forms.
(*Kunststoffe*, 1957/June/315.)

Continuous production of silane derivative.—Ràskay and Nàdasy describe a process and apparatus for the continuous production, in the laboratory, of tetraoxysilane in the gas phase. The account is critical and details the results of numerous experiments under a wide range of operating conditions.
(*Magyar Kémikusok Lapja*, 1955/January/1.)

Fluorocarbon plastics.—A detailed and comprehensive survey of the properties and applications of the two fluorocarbon plastics available is given by M. W. Riley. Illustration of their use in many different industries as well as tables and graphs depicting their behaviour under various physical conditions and the effect of various chemicals on them provide the reader with a valuable work of reference. Methods of fabricating are also discussed and the best methods of handling these materials are described.
(*Materials & Methods*, 1957/June/129.)

Plasticizing with esters of high molecular weight.—Zöhrer and Merz present a detailed account of the comparative properties of simple plasticizers and complex ester plasticizers. The behaviour of the latter in solvents is considered and in particular an examination is made of the quantitative tolerances of various plastics for these substances, and their effect on working properties. The author's results are summarized in copious tabular data and a list of trade names and manufacturers is given under the heading of different chemical groups.
(*Kunststoffe Rundschau*, 1957/June/233.)

PROCESSES : MACHINERY

Bagasse board plant to be built in Cuba.—A detailed account of plant for the production of compressed board made from bagasse now under construction in the Caribe area of Cuba. The board consists solely of fibres agglomerated by heat and under pressure, without the addition of artificial adhesives. Reference is made to the good properties obtained and to the improvement of the mechanical strength and water resistance of the board as a consequence of impregnation with resins, although the nature of these and the method of treatment are not given.
(*Revista de la Sociedad Cubana de Ingenieros*, 1956/October, November/572.)

Continuous working of plastics with worm-feed presses.—An exhaustive treatise by Hohle on the worm feed press for continuous working of P.V.C., polyamides, polystyrene, polyethylene and other plastics. The author opens with an historical introduction and then goes on to consider the design and operation of the new "SN 63" type machine with particular reference to heating- and temperature-control systems. The application of various attachments for different operations is described. Other types of machine with similar functions, but not obtainable in Germany, are noted. Future developments of this type of equipment are touched upon. The account is well illustrated with working drawings.
(*Plaste und Kautschuk*, 1957/June/211.)

INDUSTRIAL APPLICATIONS

Polyamides as engineering materials.—A general review of the mechanical properties, physical characteristics and working qualities of nylon and perlon by Wernes Laies. The author pays particular attention to the control of water content during the injection moulding process and to the dimensioning of parts in order to allow for the compensating processes of shrinkage on cooling after moulding on the one hand and subsequent expansion due to water absorption. It is pointed out that no hard and fast rule exists which enables precise calculations to be made in regard to dimensioning. A list of proprietory polyamides and manufacturers is given.
(*Der Plastverarbeiter*, 1956/December/446.)

Ship's propellers in polyamide.—The Dansk Termoplastisk Industrie A.S., in Copenhagen showed at the German Industries Fair at Hannover a ship's propeller made of a polyamide resin. It was designed for a 45-ton North Sea fishing boat, powered with a 100 h.p. engine, running at 300 r.p.m. The propeller weighed 8.2 kg. as contrasted with one in bronze weighing 45 kg. Such propellers are recommended where ice may be encountered and are not subject to cavitation corrosion. The largest of such propellers so far made is 1.4 m. in diameter but larger models are planned. It is indicated that propellers of this type have been under test for nearly six years and have so far given every satisfaction.
(*Kunststoffe Rundschau*, 1957/June/250.)

MISCELLANEOUS USES

Motorcycle frame in plastics.—An illustration is given of a motorcycle frame all of which is specially designed for, and executed in, a plastic. Although not specially stated to be so, it appears that the material used is of the glass-fibre-reinforced type.
(*Österreichische Plastic Rundschau*, 1950/December/61.)

Are plastics poisonous?—An interesting note by Prof. Heinrich Berger in reply to certain statements in the West German popular press on the subject of the subject of the alleged toxicity of plastics, particularly in relationship to packaging. Berger likens the charges to those levelled against aluminium in its early days. The role of scientific control is emphasized especially as regards to the plasticizers used and it is demonstrated that the hazards insinuated by the lay press reports are, in fact, non-existent.
(*Kunststoffe*, 1957/April/151.)

Composite roofing system.—A roofing system is described, the main structural element of which consists of concrete slabs laid on an appropriate support with an interface layer consisting of strips of specially prepared poly-isobutylene (molecular weight above 120,000) under the name "Posolene E." The material is in the form of strip 1 metre wide and may be obtained in thicknesses from 1 mm. to 2 mm. The mechanical properties of the strip are: breaking strength 20 kg/cm² at 20° C.; elongation at rupture 200% at 20° C.; compressive strength 40 kg/cm² at 20° C. The material is delivered in standard 40 kg. rolls, the length of the strip depending on its thickness. It is manufactured by Société Chimique de Gerland, 69 Rue due 4-Août, Villeurbanne (Rhône). The account gives working drawings to illustrate the system of use.
(*Cahiers du Centre Scientifique et Technique de Batiment No.* 27 (Cahier 234). Not dated.)

Aeroplastics tooled-up and made many components for the Fairey Delta 2, holder of the World Air Speed Record.

Come and see us on our Stand (No. 103) at the Society of British Aircraft Constructors Flying Display and Exhibition, Farnborough, Hants, 2nd to 8th September, 1957.

the fastest

way to get something done with plastics is to come and talk to Aeroplastics about it. If it can be done, Aeroplastics can do it—almost certainly *have* done it. Research and special developments for the aircraft industry have created a knowledge of moulding and fabrication techniques whose equal may be hard to find elsewhere.

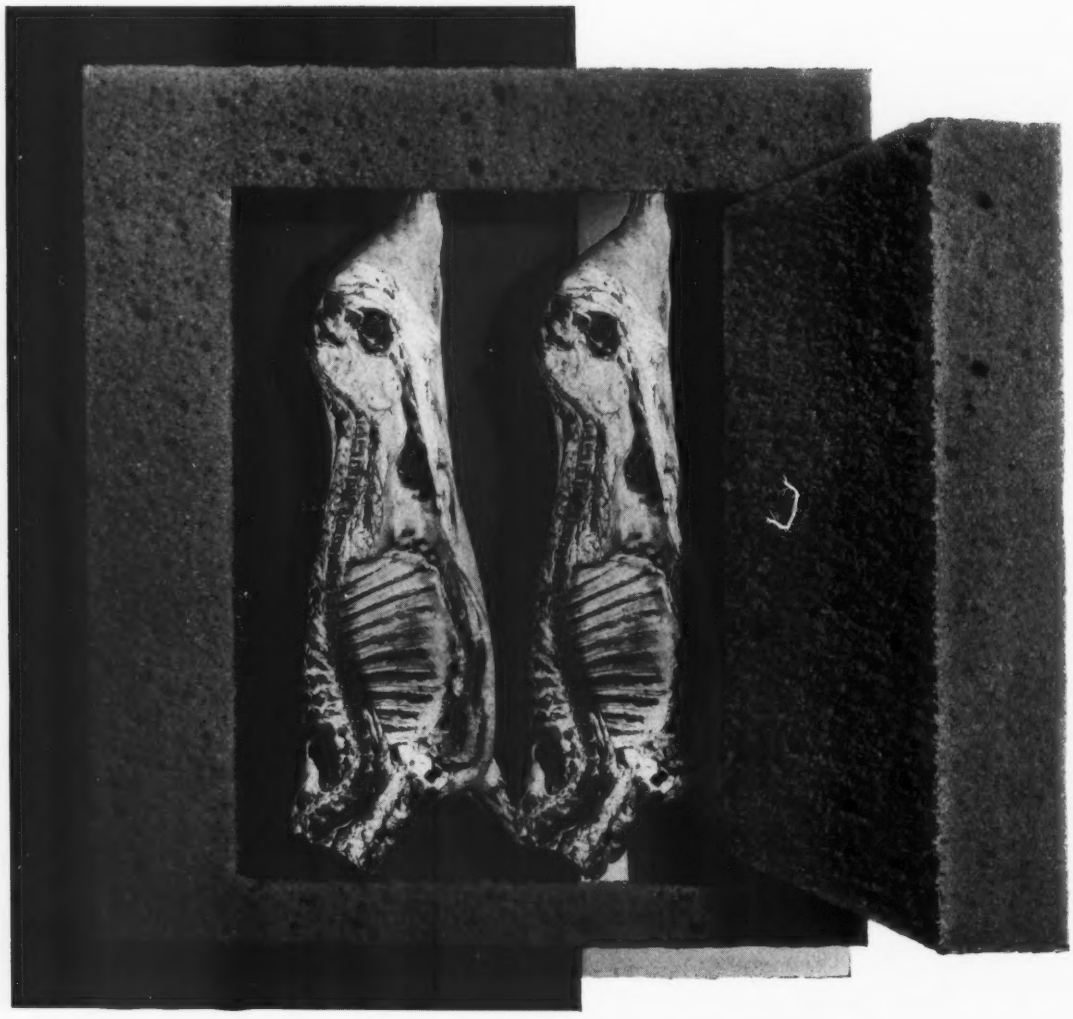
Aeroplastics have capacity for long or short-run production in any material, by any method; compression or injection moulding, fabrication, impregnation, glass fibre/polyester products, tool design and manufacture: and for any aspect of production or development in plastics where breadth of experience and ample facilities are needed.

AEROPLASTICS LIMITED

HILLINGTON · GLASGOW

A subsidiary of The Fairey Aviation Co. Ltd.

M



new insulation, light and strong

with Isocyanates and POLYESTERS by ICI

These simple-to-mix components give rigid foams to provide the refrigeration industry with a remarkable new insulating material that combines high thermal resistance with strength and lightness.
Easily mixed on the site, the components produce the foam in the cavity to be filled.
Foams of varying density can easily be made.

Ask for details of **Daltolac 21** and **Suprasec D**

Enquiries should be addressed to:
I.C.I. Sales Development Department (Polyisocyanates),
Ship Canal House, King Street, Manchester 2.

D.880 **IMPERIAL CHEMICAL INDUSTRIES LIMITED LONDON SW1 ENGLAND**

Epoxy Plasticizers for P.V.C.

By T. C. MOORSHEAD*, B.Sc.

The properties of epoxy plasticizers derived from vegetable oils are described and compared with other types.

THE search for new products for use in the compounding of polyvinyl chloride and its copolymers will continue so long as there is a demand for improved properties.

In flexible p.v.c. it is the plasticizer more than any other constituent which determines the properties of the finished compound, and it is not unnatural, therefore, that a very great deal of effort has gone into the search for better plasticizers. The practical value of any raw material is a compromise between the properties it provides and its cost, and plasticizers are no exception to this rule. A plasticizer which is cheap will find a ready market even though it has some inferior properties: a comparatively expensive plasticizer must possess some particular advantage in order to justify production.

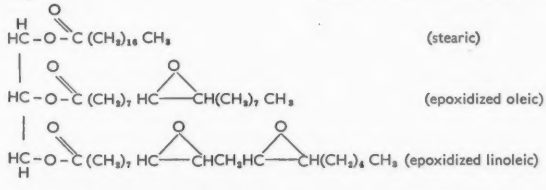
In this country, vegetable oils are relatively expensive, and would not at first sight appear to be an attractive raw material for the production of plasticizers. However, the valuable properties of the plasticizers which are being produced from vegetable oils more than justify their cost.

Vegetable oils, and alkyl esters of their fatty acids, are not sufficiently polar to be solvents for p.v.c. resin. If, however, the double bonds of the unsaturated fatty acids are converted to epoxy groups, the glycerides and certain esters of the fatty acids are rendered sufficiently polar to be compatible with p.v.c.

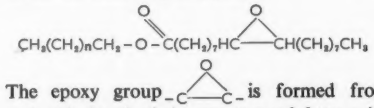
Chemical Structure of Epoxidized Oils and Esters

The naturally occurring glycerides differ in constitution, and any individual glyceride molecule may contain any combination of three fatty acid radicals from a selection of fatty acids characteristic of the particular oil. Only a limited number of oils are suitable for epoxidation and the production of plasticizers.

The following represents a typical epoxy glyceride molecule:—



The epoxidized ester is a smaller molecule of which the following is typical:—



The epoxy group $-C\overset{O}{\diagdown\diagup}C-$ is formed from a double bond of the unsaturated fatty acid; and unlike the double bond, the epoxy group is polar.

The value of the epoxidation process does not lie only in converting an initially incompatible material into a plasticizer, as the epoxy groups themselves possess valuable stabilizing properties.

* A. Boake, Roberts & Co., Ltd.

Epoxides as Plasticizers

Both the glycerides and the esters of epoxidized fatty acids are sufficiently compatible to function as plasticizers for p.v.c. resins, but from their difference in structure it is obvious that they will have quite different properties in p.v.c. compounds.

The glycerides are relatively viscous and have a very low vapour pressure. In consequence, their ability to confer flexibility on p.v.c. is less marked than a typical plasticizer such as dioctyl phthalate when compared weight for weight; but to offset this, their resistance to loss through ageing or extraction at normal or elevated temperatures is far superior. In this respect the glycerides are similar to that class of plasticizer commonly referred to as " polymeric."

The esters, on the other hand, have a low viscosity. Compared with dioctyl phthalate on an equal weight basis, they produce highly flexible p.v.c. compounds with excellent low temperature flexibility, but they are not superior to dioctyl phthalate in resistance to loss through volatility or extraction.

Compatibility with p.v.c. and Copolymers

Neither the glycerides, nor the esters, can be classed as primary solvent plasticizers, if complete compatibility under the widest range of conditions is taken as an essential property to meet this definition. Both can be used as the sole plasticizer to make p.v.c. compound free from sweating or exudation, but not under all circumstances.

The epoxy glycerides exhibit better compatibility than the epoxy esters. The type of resin used, and the stabilizer, can, however, have a marked effect on the compatibility of a particular formulation. In the case of stabilizers, lead stearate, for instance, has been found to be unsuitable for use with epoxy glyceride plasticizers, since a slight greasy exudation usually develops after several weeks when lead stearate is used with the epoxy glyceride as the sole plasticizer. This effect is not produced by other stearates commonly used as stabilizers in p.v.c. formulations. Differences have also been found in the compatibility of compounds plasticized with epoxy glyceride and based on different resins. It is preferable, therefore, to make up a trial compound of any particular formulation in order to be certain that no undesirable surface effect is produced.

When the glyceride is used with another plasticizer it is preferable to avoid those which themselves show limited compatibility. In this class are included dinonyl phthalate, adipates. sebacates, butyl acetylricinoleate and extenders, With aryl phosphates and phthalates of C8 range alcohols, no difficulty is likely to be experienced.

The same general remarks apply also to the epoxy esters, but these tend to be more sensitive than the glycerides. As has been pointed out earlier, the esters are also good low temperature plasticizers similar to adipates, sebacates and alkyl phosphates. As a group, such low temperature plasticizers are generally considered as " secondary " and care must be taken in using them in compounds.

In most cases, the esters would be used in proportions up to 20% or 25% of the total plasticizer content in order to improve low temperature properties or resilience; and under these circumstances, they normally show complete compatibility.

Electrical Properties

The glycerides are comparable with phthalates in their suitability for use in compounds of high volume resistivity for dielectric insulation. (Fig. 1.)

The esters, on the other hand, are once again similar to adipates and sebacates in giving relatively low volume resistivity in p.v.c. compounds. This property, however, is more often an advantage than a drawback in non-dielectric applications, since the low resistivity compounds are less troublesome where static charges are involved. In addition, their use in a formulation materially assists in achieving high conductivity with antistatic additives.

Plasticizing Properties

Table 1 summarizes the plasticizing properties of the epoxy glyceride and epoxy ester, and shows comparable figures for di-iso-octyl adipate, D.A.P.** and tritolyl phosphate. Each compound contains 37.5% of plasticizer.

It will be seen that the esters are comparable with the usual low temperature plasticizers. They improve resilience, handle and drape and reduce static build-up: and they are efficient in use, since less is needed to achieve a flexibility equal to that obtained by the use of phthalates and phosphates.

Fig. 2 shows graphs of the 100% modulus at 23° C. of the glyceride, ester and DAP**, for different concentrations of plasticizer in p.v.c. compound.

The glycerides, because of their low volatility and resistance to extraction, should be compared with polymeric plasticizers.

There is a growing demand for plasticizers which are well retained under severe conditions of prolonged elevated temperatures, and which are also less liable to migrate to other surfaces —thus causing marring or softening. The polymeric plasticizers, typical of which is polypropylene sebacate, are invaluable for such applications. Such polymeric plasticizers can be produced with a wide range of properties; but, as a general rule, the more efficient they are as plasticizers from the mechanical aspect, the less resistant they are to loss through ageing and migration.

Table 2 gives a comparison of a glyceride with several types of polymeric plasticizer.

Compared in this way, the glyceride shows

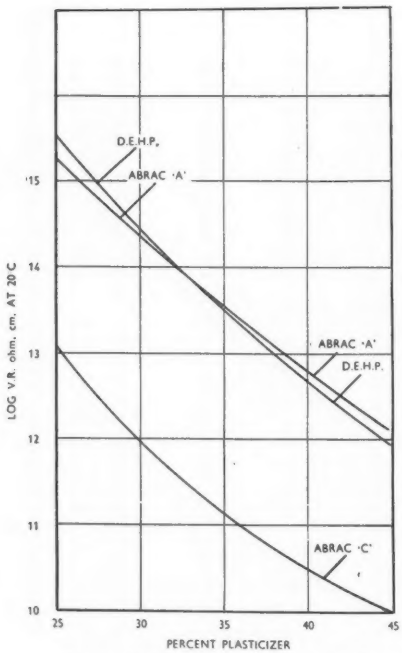


Fig. 1. Volume resistivity of typical compounds

TABLE 2

	Glyceride Abrac "A"	"Polymeric Plasticizers" 1	2	3	4	5
Tensile strength p.s.i.	2,950	3,030	2,890	3,200	2,880	2,985
Elongation at break %	335	270	300	305	360	280
100% modulus p.s.i.	1,500	2,120	1,760	1,710	1,390	2,150
Relative volatility loss	0.08	0.34	0.25	0.22	0.43	0.26
Cold flexibility temperature °C.	− 16.0	− 1.4	− 6.2	− 2.6	− 15.6	+ 2.5
Extraction by water %	0.12	0.22	0.18	0.15	0.19	0.23
Extraction by petrol %	1.5	0.10	nil	0.01	1.6	nil

an excellent compromise between permanence and plasticizing properties. Furthermore, the glyceride is easier to process than high molecular weight polymerics.

In order to carry the comparison a stage further, Table 3 illustrates the results of a comparative test.

Duplicate tests were made on compounds plasticized with a polymeric plasticizer (No. 1), and also with a typical monomeric plasticizer (D-2-EHP).

Samples of the compound (0.05 in. thick sheet) were heated in a circulating air oven at 120° C. for 65 hours.

Under these conditions the glyceride is evidently closely comparable in retention of properties on ageing with the polymeric plasticizer, while the latter is less efficient in plasticizing properties.

TABLE 1

	Epoxy Glyceride Abrac "A"*	Epoxy Ester Abrac "C"*	D.I.O. Adipate	D.A.P.**	T.T.P.
Tensile strength, p.s.i. 23° C. ...	2,950	2,250	2,400	2,400	3,300
Elongation at break % 23° C. ...	335	375	340	400	290
100% Modulus, p.s.i. 23° C.	1,500	900	1,020	1,060	1,850
Volatility loss	0.08	0.8	0.9	0.46	0.39
Low temperature flexibility °C. ...	− 16	− 44	− 50	− 25.5	− 1.0
Extraction by water %	0.12	0.20	0.24	0.16	0.14
Extraction by petrol %	1.5	23.4	24.1	19.8	1.02

* Abrac "A" and "C" used in this work are trade names for epoxy glycerides and esters marketed by A. Boake, Roberts & Co., Ltd.
**This refers to the phthalate of "Alphanol 79"—trade name of I.C.I. and Shell Chemicals Ltd.

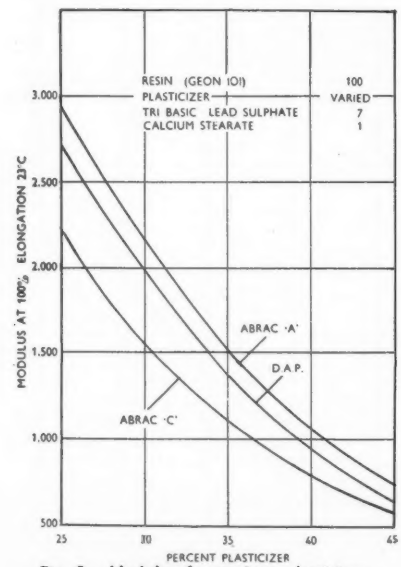


Fig. 2. Modulus for various plasticizer concentrations

Another important property which has received considerable attention is the liability of p.v.c. products to mar other surfaces with which they are in contact. While in some cases this may be due to the use of unsuitable pigments, the marring effect is more often caused by migration of the plasticizer in the p.v.c. compound to the particular surface, e.g. a surface coating or another thermoplastic.

Table 4 shows the results of marring tests in which p.v.c. compounds plasticized with Abrac "A," D-2-EHP and polypropylene sebacate were pressed into contact with nitrocellulose, alkyd U/F and high impact polystyrene sheet.

Here again, the epoxy glyceride is at least equivalent to the polymeric plasticizer.

TABLE 4

	Appearance after 21 days: High Impact Polystyrene	Stoved Enamel	Nitrocellulose
Abrac "A"	1	0	4
Popypropylene sebacate	1	1	4
D-2-EHP	1	1	4

Scoring: 0 No mark. 1 Mark just visible. 2 Slight marring. 3 Marring. 4 Heavy marring (tacky).

Epoxidized Oils and Esters as Stabilizers

As mentioned earlier, the epoxy plasticizers are valuable stabilizers for chlorinated resins. The ideal stabilizer should be:—

(1) A fluid, for ease of incorporation and lack of effect on clarity and colour of compound.
(2) Unaffected by chemical reactions causing change of colour, e.g. sulphur staining of lead and cadmium stabilizers, and the staining of lead-containing surfaces by stabilizers containing sulphur.
(3) Free from heavy metals which may be objected to on grounds of toxicity.
(4) Relatively inexpensive.
(5) Effective for a wide range of compounds.

The epoxy plasticizers score easily on all these points.

In this connection, it should be emphasized that the glycerides and esters are very similar in heat and light stabilizing properties. This is so in spite of the fact that the glycerides contain about 50% more oxirane oxygen (oxygen of epoxy group) than the esters. Heat stability tests, done under very carefully controlled conditions, show that the glycerides are slightly more efficient than the esters; but the difference is not nearly so great as would be expected if the stabilizing properties were due solely to the ability of epoxy groups to neutralized hydrochloric acid evolved during the process of degradation of the polyvinyl chloride resin.

TABLE 3

	Epoxy Glyceride Abrac "A" Initial	After ageing	Polymeric No. 1 Initial	After ageing	Monomeric Di-2-ethylhexyl phthalate Initial	After ageing
Tensile strength, p.s.i.	2,635	2,505	3,030	2,825	2,595	2,035
Elongation at break %	325	320	270	265	350	215
100% modulus	1,445	1,475	2,120	1,970	1,165	1,435
Weight loss after ageing	—	0.43	—	1.13	—	8.62
Appearance after ageing	Slight darkening, slight distortion		Considerable darkening, marked distortion		Very discoloured severely distorted	

Heat Stability Evaluation

In evaluating a stabilizer for resins which are processed at high temperatures, it is necessary to consider several aspects.

(1) **The object of stabilization.** By far the most important function of a stabilizer in p.v.c. and p.v.c. copolymer compounds is to delay the formation of colour which is developed as the result of the presence in the resin molecule of a series of conjugated olefine linkages.

(2) The colour development must be delayed for as long as possible at any given temperature. Some stabilizers delay complete breakdown for a long period, but allow some colour to develop in the early stages. From the practical point of view, these are less useful than a stabilizer which prevents any colour development for a limited period, but allows rapid breakdown earlier than the former type.

The processor of plasticized p.v.c. is really interested in compounds which will allow him maximum latitude in time and temperature before visible change of colour develops. The procedure used for heat stability tests is as follows:—

(1) The compounds are prepared on a two-roll mill under conditions of time and temperature best suited to the type of resin and plasticizer. The average conditions are 150° C. for seven minutes.

(2) The compound is taken from the mill in sheet about 0.06 in. thick.

(3) 1-in. squares are cut from the sheet and placed on aluminium strips.

(4) The aluminium strips are placed in an oven controlled at 180° C. and with forced air draft.

(5) Eight aluminium strips are used, and one removed at each 15 minute period. Each strip may hold several different compounds and controls.

Breakdown is normally judged visually by colour, and by comparison with a control compound which shows a uniform rate of colour development. The control colours are given numbers, which can be described as follows:—

1, Clear; 2, clear; 3, just detectable change; 4, slight yellow tinge; 5, pale yellow; 6, yellow; 7, pale red; 8, red; 9, deep red; 10, black.

The first two are given the same description, since the changes are not readily detectable with the naked eye.

The study of stabilizer systems is complicated by the fact that each component—resin, plasticizer and stabilizer, can give quite different effects as each is varied. The best combination of plasticizer and stabilizer with one particular grade of resin is not necessarily the best to use with another resin. An outstanding example of this occurred during a comparison of epoxidized oils and epoxy resins. With a popular grade of emulsion resin, the epoxy resin stabilizer gave results slightly better than the epoxidized oils: on the other hand, with a suspension polymer, the epox resin gave results far inferior to the epoxidized oil.

Tests on the light stability of p.v.c. compounds show that the value of the epoxidized oils is very considerable. Owing to the length of time necessary to evaluate light exposure tests (especially with inherently light stable compounds), it has not been possible to evaluate such a comprehensive range of compounds. In the case of compounds containing substances such as antistatic agents, which greatly accelerate breakdown under exposure to light, epoxidized oils are invaluable, since they prevent such breakdown entirely. This applies also to acetylated compounds which are notoriously unstable to light.

Conclusion

The purpose of this work was to show that epoxidized oils and esters, while of value as plasticizers in their own right, have the additional advantage of exceptional stabilizing properties. They can justify their use in either field and, to this extent, are unique amongst raw materials available to the compounder.

The author wishes to express his thanks to Mr. G. H. Johnson for invaluable assistance in the practical work, and to the Directors of A. Boake, Roberts & Co., Ltd., for permission to publish the paper.

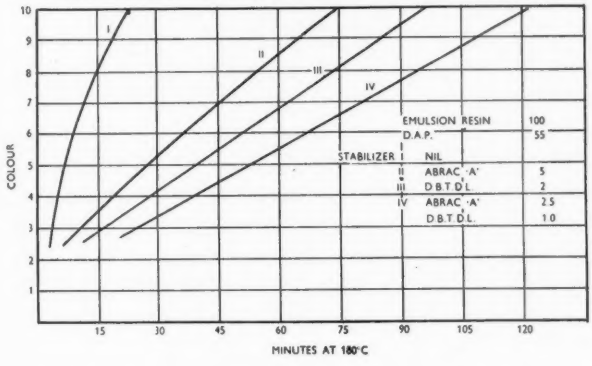


Fig. 3. Comparison of Abrac " A " with dibutyl tin dilaurate. Curve IV shows synergistic effect of a mixture of the two stabilizers

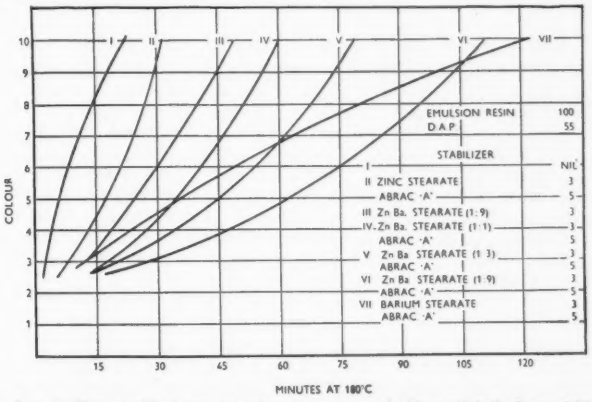


Fig. 4. Zinc and barium stearate mixtures with Abrac " A." Curve VII shows that barium stearate gives slow final breakdown, but is poor in the early stages. Curve II shows zinc stearate alone with Abrac " A," little better than control. Curve VI shows the strong synergistic effect of a small amount of zinc stearate with a barium stearate and Abrac "A." Curves IV and V show the effect of a higher proportion of zinc stearate. Curve III shows that the optimum mixture of zinc and barium stearate is not effective without the epoxy plasticizer

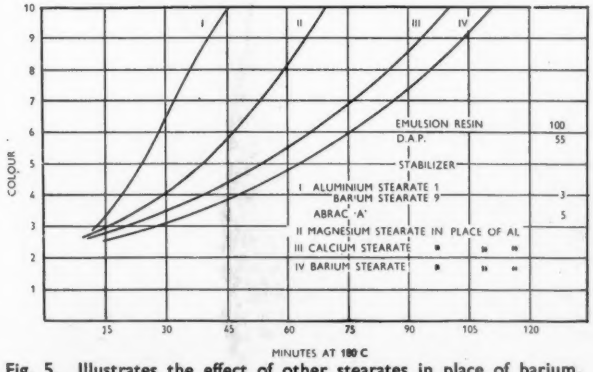


Fig. 5. Illustrates the effect of other stearates in place of barium. Calcium is nearly as good as barium in this type of formulation.

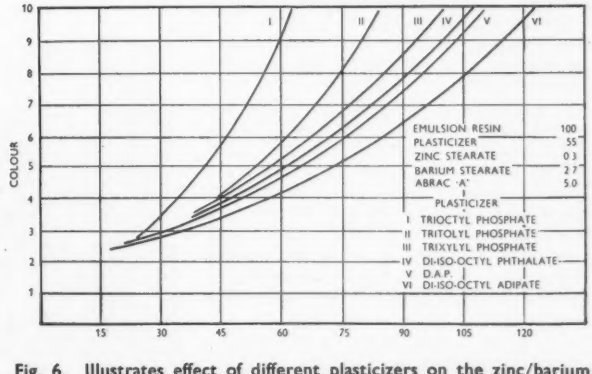


Fig. 6. Illustrates effect of different plasticizers on the zinc/barium stearate, Abrac " A " stabilizer system. Of special interest is the marginal difference between trixylyl phosphate and di-*iso*-octyl phthalate in the system.

Machines for the Industry

The H.P.M. Injection Moulding Machine

A description and drawing of this 20/28 oz. machine is given on this and the following pages. The H.P.M. machines are manufactured by Cravens Ltd. of Sheffield for Wickman Ltd., Fletchampstead Highway, Coventry.

IN the February issue of *Plastics*, pages 56 and 57, we gave some details of the 400-H-20 H.P.M. injection moulding machine which was the first one made in this country to the American design. We are now able to publish further details and a drawing of this machine together with the specifications for the 300-H-12 and 800-H-48 of 12 oz. and 48 oz. capacity. The principle of operation of these machines is the same as the 400-H-20.

The 400-H-20 has a normal shot capacity in polystyrene of 20 oz. which can be increased to 28 oz. by using prepacking or a double feed stroke. The press is semi-automatic in operation, the full-cycle being initiated by the closing of the guard, and is self-contained having its own pump and oil reservoir. The injection platen is a fixed platen supporting four tie bars on which the mould platen travels. Mould clamping pressure is supplied by a hydraulic cylinder (2) which has both a booster to give fast approach and main area ram to give full locking force. The ejector mechanism which is of the fixed bar type can be adjusted by two handwheels (1) and provides a positive ejection. The hydraulic oil reservoir with sight glass and temperature indicator (3) is placed above the mould closing cylinder and has a capacity of 120 gallons.

The heating chamber in the injection cylinder is notable for the size of spreader (7) used. This chamber is made in three sections, the spreader being an integral part of the centre section which thus ensures a quick and effective heat transfer to the material as it passes through the chamber. The nozzle (13) and nozzle section of the chamber can be detached but the first section is permanently attached to the chamber. The whole chamber is chrome plated. A unique method of fitting by locking wedges (32) enables the heating chamber to be quickly removed from the machine for cleaning or replacement. For removal the whole injection unit is retracted beyond its normal position, the wedges taken out and the chamber lifted clear. The feed chamber (11) is water-cooled.

The injection plunger (12) is attached to the injection ram (15) by a coupling and spacer (14) which enables the plunger to be easily withdrawn and removed. The spacer also actuates the compensating feed mechanism which will be described later. The injection ram is fitted with a booster ram (16) for the initial fast pre-positioning. The valve manifold (31) gives a run round system for filling the main area.

A positive sprue-break mechanism is afforded by the hydraulic cylinder (10) which retracts the whole injection unit to a pre-set stop (18). The adjustment of this distance is by the hand wheel (17). For removal of injection cylinder as described previously this stop is moved by the lever attached to it and full retraction is then possible.

Heating and Cooling

The injection cylinder is fitted with band heaters divided into three controlled zones. A separate nozzle heater which is controlled by the operator is also fitted. Temperature control is by three Ether-Wheelco Capaciline anticipatory instruments which incorporate a special unit to compensate the "hunting" action of on/off type controllers.

The cooling system is of the water circulatory type to a tank in the base of the injection unit. A sight glass (19) shows that circulation is taking place and three valves (19a, 19b, 19c) control the flow from the moving mould platen, the fixed injection platen, and the feed chamber, respectively.

Compensated Weigh-feed

The weigh feeder consists of a large hopper which feeds the material on to the vibrating chute. A quadrant with an indicator plate can be adjusted to give a varying depth of granules in the chute. The rate of feed from the hopper to the weigh pan is governed by the amplitude of the vibrations of the chute and the depth of granules in the chute. The amplitude of the vibrations is controlled by a rheostat. The weigh pan when empty is balanced by the weight table and a chain which is looped underneath. For normal starve feeding the maximum amount of chain should hang from the weight table when the injection plunger is fully forward. For starve feeding a less amount of chain should hang under the weight table. The scale may be balanced by adjusting knurled nuts above the weight table.

The two beam switches shown are for (a) switching off the fast feed and (b) switching off the fine feed. The amount of material to be weighed on fine feed is controlled by the force exerted up under the scale table by the pivoted counter weight. To increase the weight of fine feed it is only necessary to adjust knurled nuts on the pivot arm.

The bracket carried by the injection plunger is fitted with a collapsible plunger. The collapsible plunger is normally considered to be rigid, but should maladjustment be made the plunger will collapse before the weigh feeder linkage is overstrained. The collapsible plunger, as it nears the fully forward position, engages the compensator stud moving this stud forward which increases the weight of chain panned under the weight table. A $\frac{1}{4}$ in. of movement of the plunger will move the chain $1\frac{1}{2}$ in. or 3 in. dependant on the bulk factor setting made in the linkage. For starve feeding it is not normally necessary to adjust the bulk factor corrector for the majority of materials.

The Hydraulic System

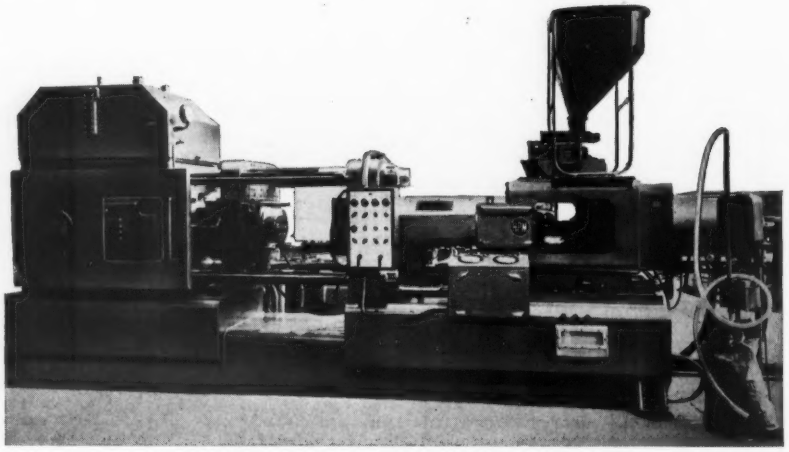
An electric motor drives two hydraulic pumps the first being a double pump with a delivery of 40 and 10 galls. per minute, the second is a high pressure pump with a delivery rate of 6 galls. per minute. Hydraulic pressures are controlled by means of a small control panel adjacent to the main press control switches. The two dials (8, 9) show the clamping and injection pressures and are protected by two choke valves (8a, 9a). Valve (10a) is a choke valve controlling the feed to the injection unit retraction cylinder (10). Control valves for low and high clamping and injection pressures (21, 22, 23, 24) are housed beneath the pressure gauges.

Operation of a Semi-Automatic Cycle

With the safety gate open no solenoids are energized and the pumps are passing the oil at low pressure back to tank. Closing the safety gate will set up an electrical circuit so that the output of all the pumps will be directed to the clamp booster ram. The clamp will close at fast speed.

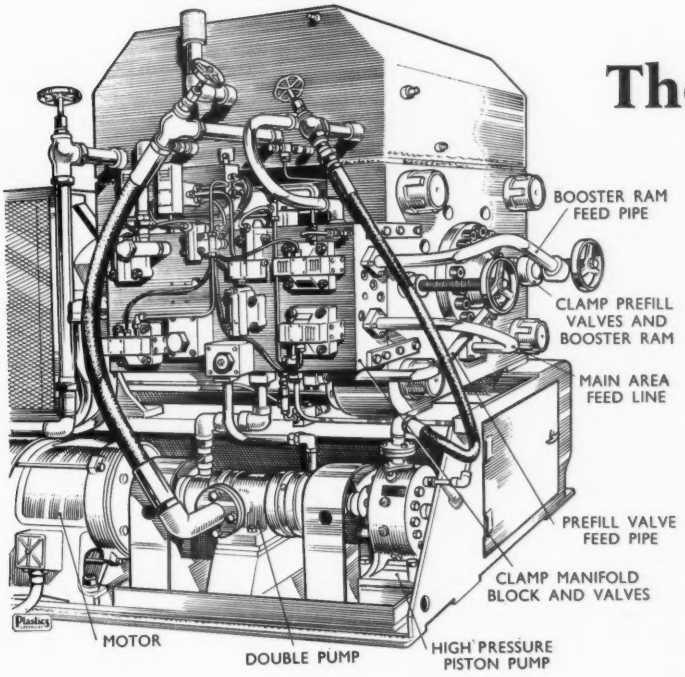
Just before the dies close a limit switch (28) will be operated which will cause the output of the pumps to be directed to the full clamp area. The clamp will now close slowly and the force will build up to the full tonnage as set by the relief valve (22).

As the clamp pressure builds up it will direct

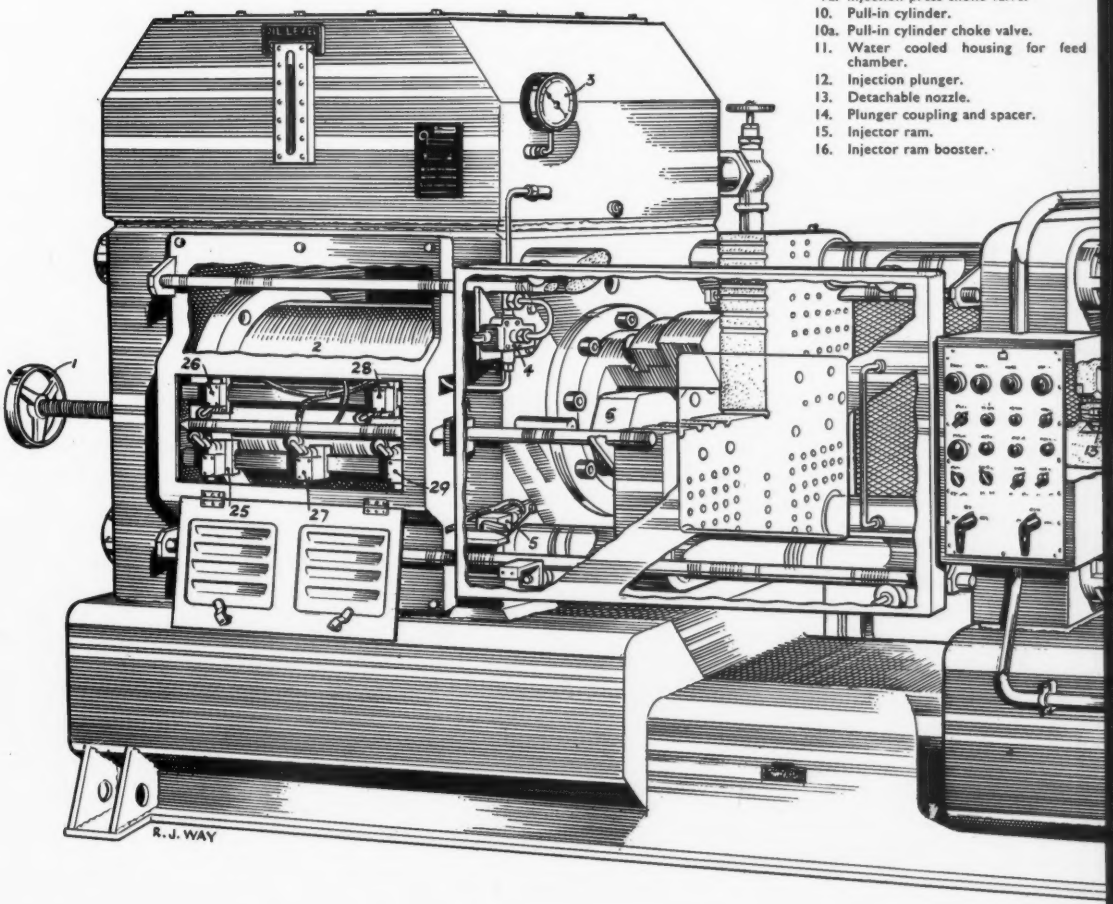


The 400-H-20 H.P.M. injection moulding machine

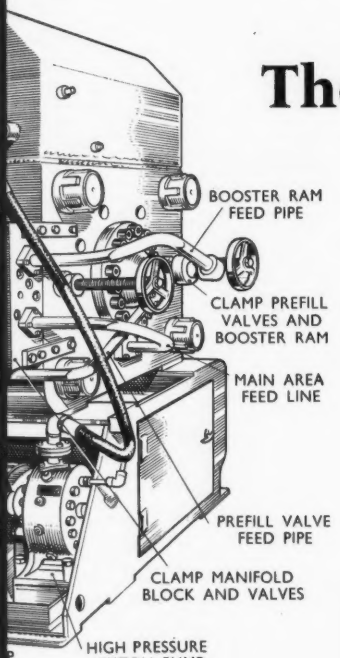
The H.P.M.



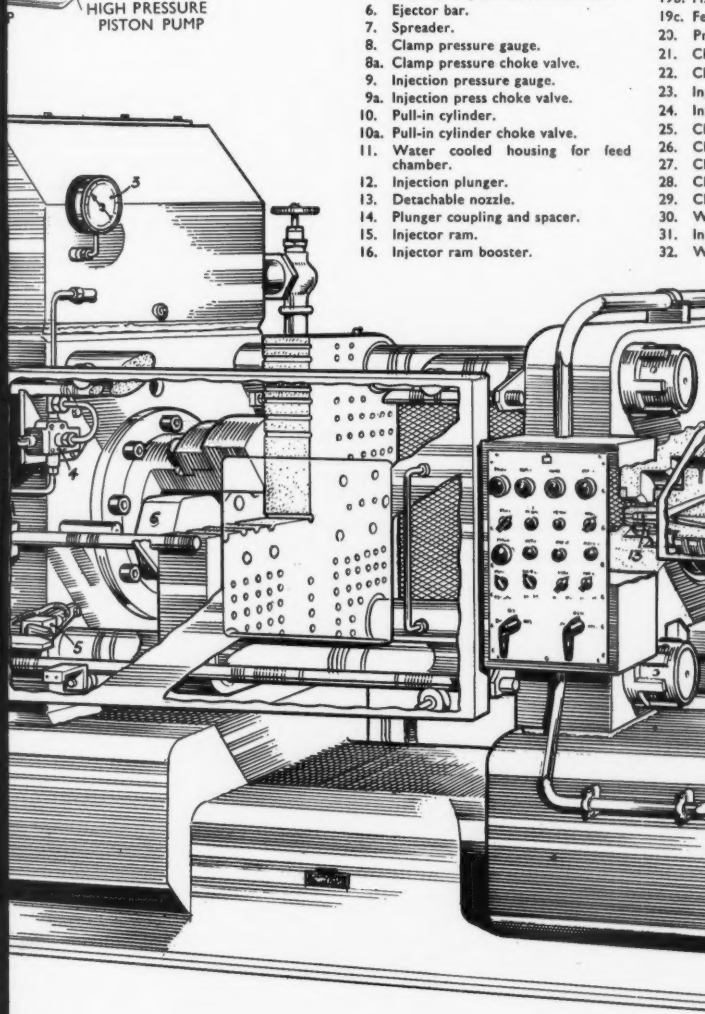
1. Ejector bar adjusters.
2. Clamp cylinder.
3. Oil temperature.
4. Hydraulic safety interlock.
5. Automatic cycle start limit switch.
6. Ejector bar.
7. Spreader.
8. Clamp pressure gauge.
8a. Clamp pressure choke valve.
9. Injection pressure gauge.
9a. Injection press choke valve.
10. Pull-in cylinder.
10a. Pull-in cylinder choke valve.
11. Water cooled housing for feed chamber.
12. Injection plunger.
13. Detachable nozzle.
14. Plunger coupling and spacer.
15. Injector ram.
16. Injector ram booster.



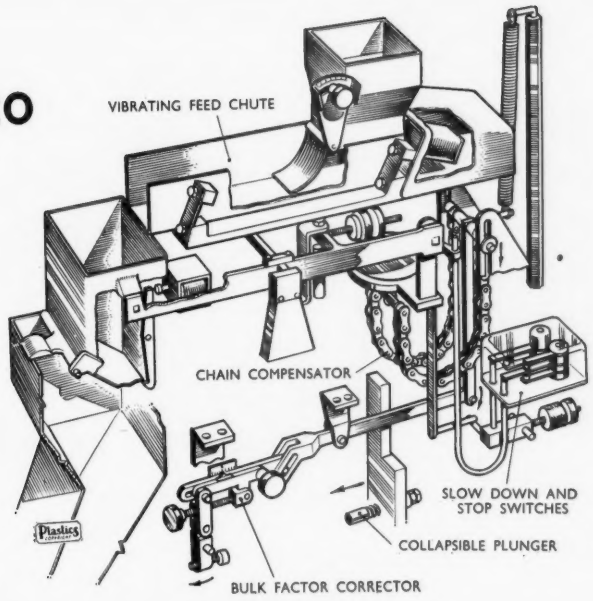
The H.P.M. 4


BOOSTER RAM FEED PIPE
CLAMP PREFILL VALVES AND BOOSTER RAM
MAIN AREA FEED LINE
PREFILL VALVE FEED PIPE
CLAMP MANIFOLD BLOCK AND VALVES
HIGH PRESSURE PISTON PUMP

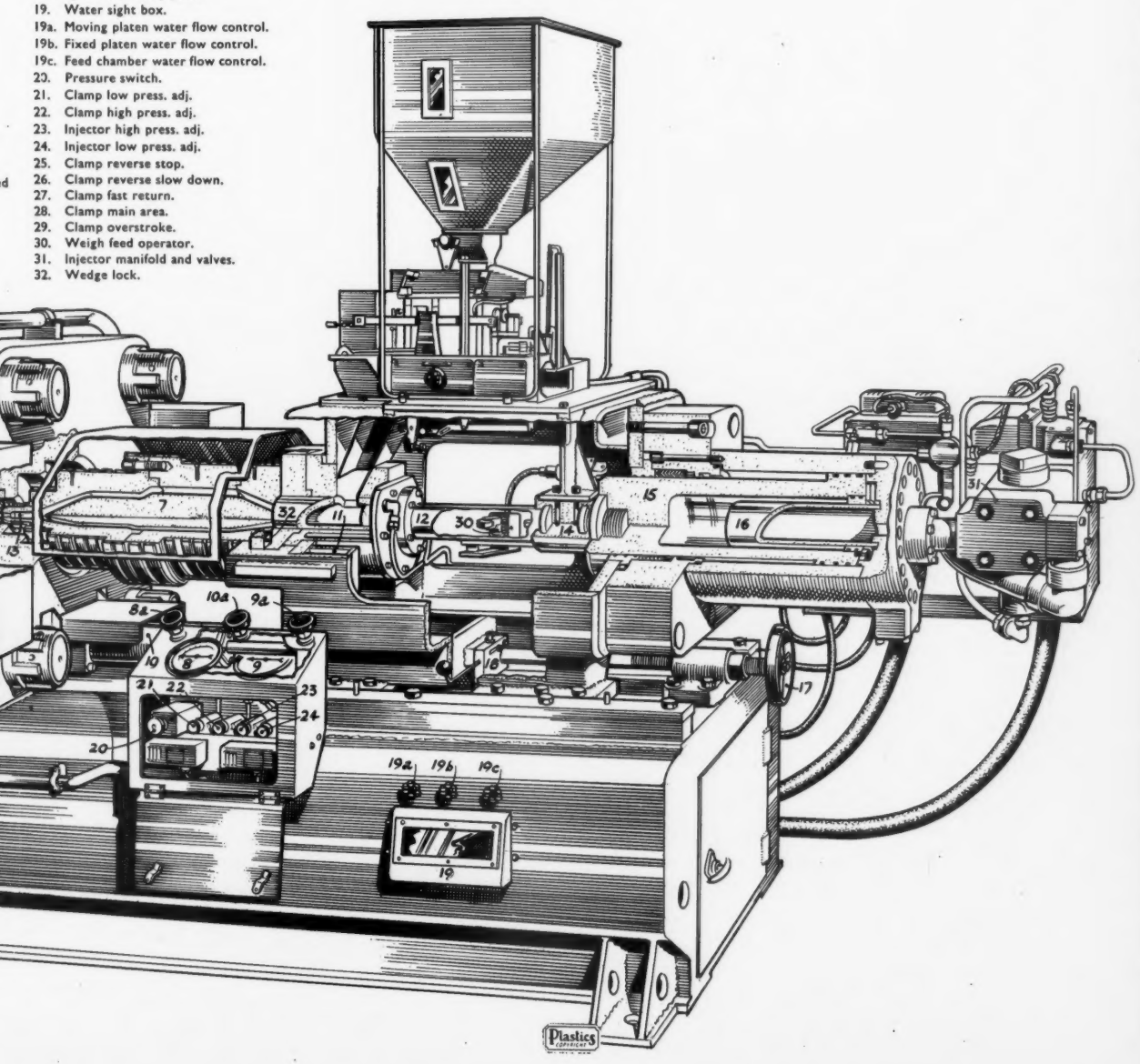
1. Ejector bar adjusters.
2. Clamp cylinder.
3. Oil temperature.
4. Hydraulic safety interlock.
5. Automatic cycle start limit switch.
6. Ejector bar.
7. Spreader.
8. Clamp pressure gauge.
8a. Clamp pressure choke valve.
9. Injection pressure gauge.
9a. Injection press choke valve.
10. Pull-in cylinder.
10a. Pull-in cylinder choke valve.
11. Water cooled housing for feed chamber.
12. Injection plunger.
13. Detachable nozzle.
14. Plunger coupling and spacer.
15. Injector ram.
16. Injector ram booster.
17. Sp
18. Sp
19. W
19a. M
19b. Fi
19c. Fe
20. Pr
21. Cl
22. Cl
23. In
24. In
25. Cl
26. Cl
27. Cl
28. Cl
29. Cl
30. W
31. In
32. W



400-H-20



17. Sprue break reverse stop.
18. Sprue break stop plate.
19. Water sight box.
19a. Moving platen water flow control.
19b. Fixed platen water flow control.
19c. Feed chamber water flow control.
20. Pressure switch.
21. Clamp low press. adj.
22. Clamp high press. adj.
23. Injector high press. adj.
24. Injector low press. adj.
25. Clamp reverse stop.
26. Clamp reverse slow down.
27. Clamp fast return.
28. Clamp main area.
29. Clamp overstroke.
30. Weigh feed operator.
31. Injector manifold and valves.
32. Wedge lock.



the output of the double pump to the injection end. This output is further directed to the full injection area.

At the end of the injection full pressure timer setting the injection pressure will be reduced to the low pressure setting and the large output of the double pump will be by-passed to tank. At the end of the injection time both outputs of the pump will be directed to the injection reverse area. If required, clamp pressure may be directed to retract the whole injection unit for sprue-break. While this happens the clamp will go on to low pressure holding.

The tonnage on low pressure holding will depend upon the setting of the low pressure holding pilot valve.

At the end of the injection reverse stroke the next shot of plastic will fall in front of the plunger and the injection ram will move it forward into the heating chamber. The injection ram will then stop at its " pre-positioned " point and remain there ready for the next shot.

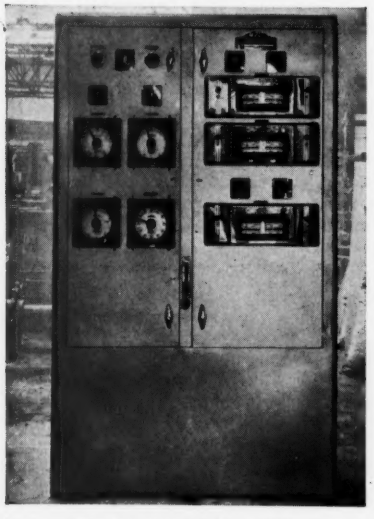
At this point the double pump output will be diverted through the cooler to tank.

At the end of the clamp timer setting the output of the high pressure pump will be directed to the pull-back area of the clamp ram. This will cause the clamp to open slowly. Since the clamp reverse is in operation it is now permissable to open the safety gate without by-passing the output of all the pumps to tank.

If the injection unit has been retracted for sprue-break, oil will now no longer be directed to this and the injection unit will therefore return to the die as oil supply becomes available.

When the die has been parted the output of the double pump will be directed to join the high pressure pump in returning the clamp ram at high speed. As the clamp ram nears the end of its stroke the larger output of the double pump will be by-passed to tank slowing down the opening speed for ejection. The opening speed from this point onwards may be controlled by a setting of the unload valve on the clamp manifold.

For a double shot the injection ram will have a second forward movement before moving forward to the " pre-position " point.



The heating and time cycle control panel.

SPECIFICATIONS.

	300-H-12	400-H-20	800-H-48
Material injected per cycle-polystyrene-general purpose (oz.-max.) ...	12	20	48
Material injected per cycle-polystyrene—" Prepacking " or double feed stroke (oz.-max.)	16	28	64
Material injected per cycle—(cu. in.-max.) single feed	20	34	81
Plasticizing capacity-polystyrene-general purpose (lb. per hr.)... ...	135	200	300
Hopper capacity (lbs.)	100	100	200
Mould clamp capacity (tons-max.) (u.s.)	300	400	800
Mould clamp return (tons)	27	40	60
Mould Space			
(a) Full platen vertically	33"	42"	54"
(b) Full platen horizontally	30"	36"	54"
Clearance between tie rods (horizontal x vertical)	17" x 20½"	21" x 27"	36½" x 36½"
Daylight opening (max.) without ram spacer	30"	40"	55"
Daylight opening (max.) with ram spacer	26"	34"	47"
Mould thickness (min.) without ram spacer	10"	15"	20"
Mould thickness (min.) with ram spacer	6"	9"	12"
Clamp travel (max.)	20"	25"	35"
Injection pressure on material (p.s.i.) max.	20,000	20,000	20,000
Injection plunger (dia.)	3½"	3⅞"	5"
Injection plunger stroke	12"	12"	18"
Heating Chamber (kW.)	21·8	35·4	37·6
Motor horsepower	40	50	100
Hydraulic oil (gallons)	120	160	400

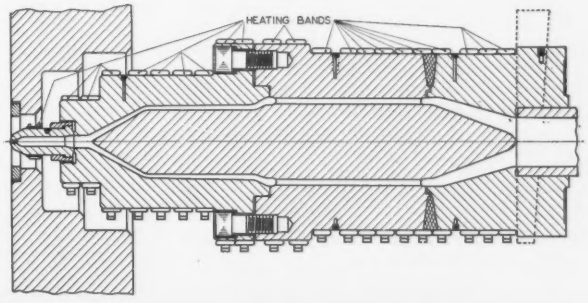
Electrical Controls

Besides the three temperature controllers already mentioned the control panel also houses the four timers used in the moulding cycle. These are for mould clamping, first injection shot, second injection shot (for pre-packing) and time on full pressure. The control panel fitted to the machine itself carries the switches for the motor, heaters, and weigh-feed mechanism, as well as the hand operating controls for use on trial runs, mould setting and testing. An emergency clamp reverse switch and a run-through for the weigh-feed unit are also situated on this control panel.

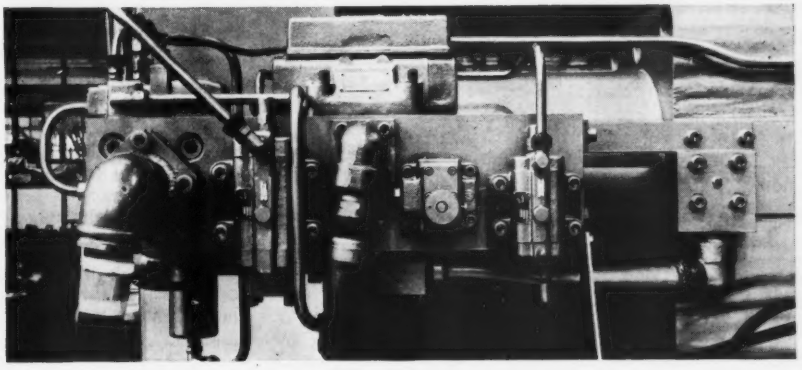
Conclusion

From this description of the 400-H-20 it will be seen that this machine combines the advantages of versatility, efficiency and simplicity in operation. The first of these is apparent from the many variations both in time and in pressures which can be employed. The large platen area and daylight afford adequate space for the use of large moulds and the efficient heat transfer gives a high plasticizing capacity. The ease with which all adjustments can be made, the accessibility of the hydraulic system by virtue of the manifold valve blocks, and other features previously mentioned overcome many of the maintenance and setting problems sometimes encountered.

Finally, we should like to acknowledge the assistance given to us by the staff of Wickman Ltd., and Cravens Ltd., who manufacture the machine for Wickmans Ltd., for their considerable help in the compiling of this report.



A sectional drawing of the heating chamber showing the torpedo and heater bands. On the right the broken line indicates the position of the wedge lock



A view of the injector manifold block.

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Fabrics

SIR,—We are interested in getting into touch with British manufacturers of p.v.c. sheet materials, suitable for curtains and the like, decorated with large flower prints.

WEST & EAST TRADING CORP.

32 Broadway,
New York,
N.Y., U.S.A.

Sheet Inquiries

SIR,—Where can I obtain supplies of a rigid plastic material perforated with about 10 to 12 holes per square inch, which I wish to use as a " bed " for a silk screen printing machine; also sheet material to cover the machine?

A. BLACKMORE.

52 Woodbury Road,
Bridgwater,
Somerset.

Ex-servicemen's Appeal

SIR,—Twelve years ago, no one could have failed to be conscious of our dependence on our Navy, Army and Air Force. Today we are so apt to forget that it is still our responsibility to help so many of those who fought for us.

One of the societies most concerned with the welfare of serving and ex-service men and women is the " Forces Help Society and Lord Roberts Workshops," which needs to raise £50,000 every year from voluntary sources, and we are appealing most urgently to the plastics industry to raise £1,000 within the next year towards this sum.

Those of us who have been in the Services must already know something of the work of this Society, and those of us who have been lucky enough to emerge from one, or both, World Wars uncrippled and still in good health must feel particular sympathy for the very severely disabled men, to whom the Lord Roberts Workshops give training and permanent employment.

Vital though these workshops are, they are only one aspect of the Society's work, which includes rehabilitation and home training centres for men too severely disabled for any form of factory life, and homes for aged ex-servicemen and convalescents.

Each year many thousands of past and present members of the Forces, both men and women, seek the help of the Society's voluntary representatives throughout the country. In 1956, they were able to help 61,468 cases at a cost of £86,928.

We make no apology for appealing to readers of *Plastics* to help those to whom we all owe so much, and we know that they will respond generously by sending a donation or annual subscription, or by arranging for a collection to be taken in their factories or business houses. Appeal literature and further particulars may be obtained from Major-General Sir John Marriott, K.C.V.O., C.B., D.S.O., M.C., Appeals Branch, The Forces Help Society and Lord Roberts Workshops, 35 Thurloe Street, London, S.W.7.

We shall look forward with confidence to the results of our appeal.

SIR JOHN MARRIOTT,
Chairman.

Appeals Branch,
The Forces Help Society and
Lord Roberts Workshops,
35 Thurloe Street,
London, S.W.7.

C. C. LAST, ESQ.,
Chairman.

British Plastics Federation,
47–48 Piccadilly,
London, W.1.

Clear P.V.C. Tube

SIR,—In recent attempts to obtain p.v.c. clear extrusion of standard sizes for development work, we found that surprisingly few companies could offer stock tubing. Could you put us in touch with any companies who hold standard sizes which we could buy without placing special orders?

PETERLITE PRODUCTS LIMITED.

24–28 Lombard Street,
London, E.C.3.

Conservation of Pictures

SIR,—The applications of plastics material to ordinary affairs have been so great that it is surprising that it has not yet had a greater impact on what still seems to constitute one of the most difficult of arts, viz. the preservation of oil paintings.

The synthetic materials, being new, are perhaps still doubted a little, and the durability of some for special purposes can only be established by practical experience over a longer period.

In the picture galleries the possibilities of plastics materials have not been overlooked, and they are extensively used, in minor ways, for conservation, but no revolutionary change has yet taken place, such as, for example, a general enclosure of the subject, as an alternative to expensive air conditioning arrangements, which are difficult, if not impossible, to apply in hot and moist climates where pictures often simply fall to pieces.

This indicates a great possibility for export of some new plastics sheet materials for enclosing pictures and displays generally. Your correspondent has, for some time, thought that a suitable hard faced thermoset sheeting could, if available, be more extensively used for protecting many surfaces, and attractive well-known laminated panelling employing a melamine surface with a phenolic core has been established for some time for other purposes.

There is no serious difficulty, apart from that of cost, in providing a plastics sheet material as a substitute for glass, but it has not yet been generally done, commercially, except in one or two isolated cases, and very expensively. A step towards a cheaper material is the new rigid polyvinyl chloride sheeting, which has a reasonably hard surface, and which, in thin sections, is sufficiently clear to give good optical results.

It is well known that a transparent coating or sheeting, secured directly to the surface of prints and printed matter gives brightness which very much improves appearance, indicating that a first-class hard-faced transparent sheeting would have a big field, and, if it could be applied to pictures, would be of great importance.

There are, of course, difficulties at present in the use of sheet materials for sealing pictures against atmospheric conditions, but no insuperable ones. Suggestions may be made for methods of doing so with the right materials.

CAPTAIN R. HOARE.

" Ivanhoe,"
Start Hill,
Bishop's Stortford.

B.I.P. Board Changes

Mr. C. H. Glassey, having completed 50 years' service with British Industrial Plastics Limited, will relinquish the office of managing director of that company's wholly owned subsidiary, B.I.P. Chemicals Limited, on September 30, 1957. He remains managing director of the parent company, British Industrial Plastics Limited, and chairman of each of that company's manufacturing subsidiaries.

Dr. W. Blakey, who is a director of the parent company, has been appointed to succeed Mr. Glassey as managing director of B.I.P. Chemicals Limited, and Mr. P. Russell has been appointed deputy managing director of that company. Both these appointments will take effect from October 1, 1957

Mr. S. Gibbs has been appointed to the board of B.I.P. Chemicals Limited and will take up the office of sales director of that company from August 1, 1957.

Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 6d. each (including postage).

B.P. 771,716. Foamed polyester-polyisocyanate reaction product. To: General Motors Corp. (U.S.A.).

A solid foamed product from a mixture containing a polyester, a polyisocyanate, a catalyst generator and a water release agent without any further addition during conversion.

B.P. 771,718. Apparatus and method for cooling thermoplastic materials. To: Midland Silicones Ltd. (U.S.A.).

Cooling an attenuated thermoplastic material in a form which can be easily crushed to powder. The molten material is continuously discharged on to an endless conveyor provided with highly heat conducting transverse fins arranged at an angle.

B.P. 771,738. Method of manufacturing mouldings. To: N. V. Philips Gloeilampenfabrieken (Netherlands).

Large elongated mouldings (rods) are produced by causing liquid synthetic resin containing no gas to solidify in a mould. The initial material is, e.g. finely powdered polythene and solidification starts at the bottom of the mould where it is in communication with a water tank.

B.P. 771,827. Method of preparing rapid-hardening artificial resin compositions containing hardening agents. To: Ciba Ltd. (Switzerland).

A polyglycidyl ether resin and a hardening agent are continuously withdrawn in a flowable condition from separate receptacles in constant relative proportions. They are supplied to a mixing device and mixed without a gaseous phase. Putty like masses, resin solder, cements are obtained.

B.P. 771,833. Fabric-reinforced polyester resin sheets or articles. L. H. Griffiths. To: Semtex Ltd.

A reinforcement of non-woven glass cloth.

B.P. 771,836. Coating textile material with thermoplastic resin or natural or synthetic rubber. Galon AB, S. I. Löfgren (Sweden).

The material (e.g. knitted tricot web) is glued on a web of strong paper. The combined web is *drawn* continuously through a machine in which a paste of polyvinyl chloride is applied while the tricot is relieved from stress. The paper may then be removed.

B.P. 771,847. Blowing agent for the production of cellular plastics. To: O. Mathieson Chemical Corp. (U.S.A.).

Hydrazine mononitrate when activated with a ferrous sulphate or molybdenum trioxide is an effective blowing agent.

B.P. 771,863. Stabilizers for vinyl chloride polymers and copolymers. To: Chemische Werke Huls A.G. (Germany).

Oxides, hydroxides and hydrated oxides of manganese.

B.P. 771,889. Container. R. Bailey. To: Aero Research Ltd.

With an intermediate container forming a cap for the main container. This intermediate container (closed by a separate cap) is made of polythene with an easily puncturable bottom membrane to allow mixing of the contents by puncturing.

B.P. 771,906. Flexible tubes. J. Moseley. To: Compoflex Co., Ltd.

Gas tube having as an armouring inner and outer wire helices and a tube body sandwiched between them consisting of an inner layer of Terylene film (Melinex) and an outer layer of synthetic rubber.

B.P. 771,946. Process for treating cords of thermoplastic material for use in the manufacture of tyres and like rubber products. To: Goodyear Tire & Rubber Co. (U.S.A.).

Refers to cords of nylon which are stretched twice at over 200° F. One of the stretching operations is preceded by dipping the cord in a cord-to-rubber bonding agent under low tension.

B.P. 771,955. Production of pigmented polymers of ethylene. To: Monsanto Chemical Co. (U.S.A.).

Polyethylene or ethylene (at least 90%) copolymer is melted by mixing in a pressure chamber. Finely divided pigment is then added the rotors being kept turning till the temperature lowered by the addition rises again above the melting point of the polymer.

B.P. 772,024. Bedpans. R. L. Dunn, J. D. Melville. To: Dunlop Rubber Co., Ltd.

With removable U-shaped cushioning on the upper rim moulded, e.g. of polyurethane foam or expanded polyvinyl chloride and a cover flap of non-foamed sheet rubber.

B.P. 772,026. Cushions for the padding of seats or the like. To: Daimler Benz A.G. (Germany).

Of synthetic plastic foam ("Moltopren") with staggered air passages interconnected by longitudinal ducts.

B.P. 772,059. Method of and means for covering tubes with plastic. L. A. Burn.

A tapered plug is inserted into one end of the tube to be covered of a maximum diameter slightly greater than the tube diameter. The plastic tube is applied to the plug, expanded by compressed air and then slid axially over the tube under controlled air escape.

B.P. 772,148. Film extrusion die. To: E. I. Du Pont de Nemours & Co. (U.S.A.).

For forming thermoplastic webs (of non-oriented polyethylene terephthalate) with beaded edges. One block of the die carries two vertically adjustable bead-controlling L-shaped members and also two vertically adjustable doctoring members.

B.P. 772,150. Inflation of toy balloons and other inflatable toys. R. Power.

A valve which may be a plastic moulding.

B.P. 772,285. Containers for food or the like. To: Ruhrchemie A.G. (Germany).

Use of synthetic paraffin wax, a product of the catalytic hydrogenation of carbon monoxide, as a coating for paper, paper-board, cardboard or metal. The coated packages are impermeable to germs and can be sterilized (milk).

B.P. 772,288. Devices for the production of head coverings and the like. C. W. Oliver. To: William Oliver's (Rubber) Ltd.

Refers to a pleating device for interleaved polyethylene and "Pliofilm" (to prevent interfusing during application of steam) for making collapsible bonnets.

B.P. 772,301. Alkali soluble synthetic resins and compositions containing same. To: S. C. Johnson & Son Inc. (U.S.A.).

Self-polishing floor coating composition of a dihydric phenol, a difunctional coupling agent and a monocarboxylic aliphatic acid.

B.P. 772,321. Heat sealed thermoplastic tubes and method of manufacture thereof. To: Waterman Pen Co. Inc.

Sealing one end of an ink cartridge (tube) with a flat polyethylene disc and a metal cap and welding the disc to the tube by heating the cap.

B.P. 772,355. Injection moulding apparatus. E. Gaspar, G. T. Shimpson, A. W. Fogg, M. G. Munns. To: Projectile and Engineering Co., Ltd.

A lengthwise movable plasticizing chamber with a feed-ram in the inlet, injection nozzle, transfer ram and transfer chamber at the outlet coaxially with the feed-ram. The mould is held stationary during injection while relative movement between feed ram and plasticizing chamber produces feed and relative movement between transfer chamber and transfer ram effects injection.

B.P. 772,362. Collapsible boats. E. A. Seal. To: Microcell Ltd.

With two upper side members of glass fibre impregnated with synthetic resin.

B.P. 772,475. Process for the manufacture of thermosetting condensation products and new products produced by this process. R. E. Vogel (Germany).

Starting materials are certain aldehydes, glyoxal and urea (or melamine) and the adjustment of the pH-value during the various stages is of importance. The products (for shaped articles, lacquers, textile finishing media, glues) are transparent, do not crack and may be machined.

B.P. 772,628. Method for producing laminated sheet material from plastic or mineral fibres. To: Owens-Corning Fiberglas Corp. (U.S.A.).

Fibres are collected into a web which is moved vertically to a collecting surface on which the web is lapped on itself to form a multi-layer mat. Tension is applied to the vertically moving web so as to stretch it. The fibres may be formed from a fluid heat-softenable material by a gaseous blast.

B.P. 772,664. Padding material for orthopædic and chiropodial uses. Leslies Ltd., V. W. Rothwell.

A felt layer and a vulcanizable foamed rubber-like material bonded to it.

B.P. 772,710. Plastic casing for centrifugal pumps. To: Amag Hilpert-Pegnitzhütte A.G. (Germany).

The casing is produced simultaneously with the delivery unit as a single moulding and the passage is formed during the moulding by a removable core.

B.P. 772,773. Glass fibre filled alkyd resin composition. To: Allied Chemical & Dye Corp. (U.S.A.).

A stable thermosetting composition having a fluffy air permeable consistency.

B.P. 772,803. Solid polyethylene products. C. R. Bruce, T. N. Williams. To: British Cellophane Ltd.

Receptivity of polyethylene vessels, sheets, and tape surfaces to printing inks and adhesives (for adhesive tape) is enhanced by passing the articles through a bath containing an aqueous solution of certain strong oxidizing agents followed by washing and drying.

B.P. 772,850. Imitation mother-of-pearl and the manufacture thereof. A.G.L.G.M.Miche de Malleray. (France).

"Pearl essence" is mixed with a liquid polyester resin and the mixture agitated until gelling of the resin starts. The mixture is then poured into a mould continuing a slow agitation until complete polymerization is achieved.

B.P. 772,914. Dispensing devices for liquid containers. To: R. T. French Co. (U.S.A.).

A closure (under a removable cap) of polyethylene with a diametrical slot and a concave outer face. The sharp undercut rim forming a thin peripheral lip aids in preventing dripping while the rate of flow is controlled by turning the (sauce) bottle about its longitudinal axis.

B.P. 772,920. Closure members for collapsible tubes and the like. M. Clerici. (Italy).

The cap is made with an annular thin-walled extension and an inner protuberance adapted to pierce a membrane over the neck of the tube. The cap can only be screwed down completely, for piercing the membrane, after breaking off the annular extension.

B.P. 772,923. Flexible containers. P. Carstensen (Denmark).

A collapsible tube is provided with a polyethylene nozzle inserted from the bottom of the tube through the neck aperture until the flared nozzle base touches the tapering end wall of the tube inside. The nozzle has a narrow resilient collar which then clicks over the upper face of the neck. A detachable cap also of polyethylene fits over nozzle and neck.

B.P. 772,929. Devices for screwing and unscrewing bottle caps. P. D. Gill (Irish Republic).

A V-shaped (plastic) base integral with upstanding walls along both legs of the V with a (polyvinyl chloride) serrated inner lining to grip caps of any diameter fitting between the two legs of the V.

B.P. 772,936. Flexible tubing. To: Flexible Tubing Corp. (U.S.A.).

Made of fibre glass sheets to which metal foil is bonded over a phenolic resin coating (between pressure rollers), applied over helically wound wire. For use in air conditioning systems.

B.P. 772,938. Stabilization of polyethylene. J. Harding. To: Union Carbide and Carbon Corp. (U.S.A.).

Superior resistance to colour change, minimum odour development and retention of dielectric properties are obtained by incorporating a small amount of 4,4'-thiobis—(6-tert-butyl-meta cresol).

B.P. 772,977. Curing resins. To: Esso Research and Engineering Co. (U.S.A.).

Insoluble, infusible, hard masses possessing good machineability and good dielectric properties are prepared by heating a sodium copolymer of butadiene –1,3 and styrene at 110–175° C. in the presence of ditertiary butyl peroxide and a powdered previously prepared resin derived from the same copolymer.

B.P. 772,980. Tobacco pipe scrapers. E. G. Jenkins (Australia).

May be moulded in position on a conventional plastic ash tray. A disc is caused to rotate in the bowl of the pipe by the action of a twisted spring biased member under axial pressure.

B.P. 772,984. Drip catcher. V. A. Pugliese.

To be fixed to the ferrule end of an umbrella stick. Has an outlet with a removable closure.

B.P. 772,997. Pressure adhesive tape. W. S. Port.

Certain co-polymers of long-chain vinyl esters are highly useful as release agents, i.e. when applied to the back of conventional tapes they form a firm smooth, glossy, non-tacky surface to which the conventional pressure-sensitive adhesives adhere only slightly and from which they cleanly separate when pulled away.

B.P. 773,038. Tongue cleaning device. S. V. Calderon (Mexico).

A handle with a loop for scraping the human tongue.

B.P. 773,041. Apparatus for sealing bags or the like. W. C. Den Dulk, C. M. Oosterbaan.

The apparatus is so constructed that in one step one half of a number of bags are sealed and in an immediately following step the other half of the number of bags (e.g. 40). The working space may be filled with an inert gas (nitrogen) after the bags have been put under a vacuum.

B.P. 773,114. Transparency slides. A. Perrot (Switzerland).

With an inner frame of plastics between metal masks.

B.P. 773,125. Production of extruded foams. To: Monsanto Chemical Co. (U.S.A.).

A blend of polystyrene and styrene copolymers in which pentane (1–10% with 2–3% water) is dissolved. The blended material is immediately extruded at a temperature of at least 250° F. and at a pressure of less than 150 p.s.i.

B.P. 773,172. Containers of synthetic resin and a device for use in their manufacture. J. Kirchlechner, F. Brockert. To: F. Brockert.

A sheet of p.v.c. is bent into a tube with overlapping longitudinal edges. The edges are softened with a solvent then pressed together. A base cut from a p.v.c. sheet is inserted as bottom and connected by means of a p.v.c. solvent distributed over the whole circumference by capillary action in the very slight space between bottom and tube.

B.P. 773,196. Packages or holders for sewing needles or other small articles. N. F. Sanders. To: Needle Industries Ltd.

An envelope made from a cellulose acetate film of a thickness of 0.003 in. or more with integral window portions and a frontal flap.

B.P. 773,231. Production of moistureproof sheet wrapping materials coated with copolymers applied from aqueous dispersions. W. Berry, R. A. Rose, C. H. Phillips, C. R. Oswin. To: British Cellophane Ltd.

The drying operation effected at about 50° C. is uneconomically slow and at 120° C. causes blisters in the usual material. This disadvantage has been overcome by applying to the base film a smooth, transparent coating of an aqueous colloidal dispersion of the polymer in partially crystalline state in a layer of such thinness that its water is wholly absorbed by the base film.

B.P. 773,265. Production of framed polyester-polyisocyanate products. J. R. Wall. To: General Motors Corp. (U.S.A.).

Variations in porosity are much reduced by cooling a polyester in which water is dispersed (for the formation of carbon dioxide) to a temperature below that at which formation of carbon dioxide occurs, mixing it at that temperature with separately cooled polyisocyanate and then heating the mixture to effect the formation of a solid foamed product.

B.P. 773,301. Trays for motor cars. D. C. E. de Wit.

A tray for a front seat as a flat plate, e.g. moulded of plastics, having hooks on top intermediate front and rear edge to engage with the inwardly and upwardly turned lower edge of the fascia panel while the rear edge of the plate abuts against a stop (L-shaped metal strip on the body front wall).

B.P. 773,320. Cabinets. D. Jackson. To: Pye Ltd.

The base of the television cabinet which itself is a laminated shell, is moulded integral with the feet and also with any projections extending within the cabinet for supporting the chassis assembly.

B.P. 773,342. Sealing closure for fluid containers. To: Fenwal Laboratories Inc.

Sterile entrance or exit openings in flexible plastic containers for medical fluids are obtained by a tube fused into the container and closed without the container by welded-in strips forming a sheath over the tube and its opening to be pulled apart for exposing the outside opening. The inside opening of the tube is closed by a tab which can be torn apart by gripping it from outside between the flexible walls of the container.

B.P. 773,510. Resol resins. D. A. Fraser, R. W. Hall, A. L. J. Raum. To: Distillers Co., Ltd.

Resol phenolic resins which are heat hardenable to give hard, infusible and insoluble products. As hot setting adhesive for plywood and for paper laminated board.

B.P. 773,519. Preparation of finely divided derivatives. To: Hercules Powder Co. (U.S.A.)

A lacquer-in-water emulsion is formed the lacquer being cellulose acetate (ethyl cellulose; nitrocellulose) dissolved in a water-immiscible volatile solvent of a boiling point below that of water. A thin layer of the emulsion is formed and on removing all liquid by evaporation, the cellulose derivative is obtained as a dry fine powder.

B.P. 773,529. Preparation of polymeric materials. To: General Electric Co. (U.S.A.).

Polyethylene (halogenated polyethylene; chlorosulphonated polyethylene) is exposed to a beam of at least 10^7R. This increases greatly the tensile strength and resistance to solvents.

B.P. 773,541. Joints for use in pipelines and between parts of vessels. J. P. A. Macdonald. To: Crane Packing Ltd.

Provision of continuous serrations or corrugations on the opposite faces of the joint element of, e.g. polytetrafluoroethylene to be received in recesses in the opposing ends of the pipelines.

B.P. 773,542. Plastic coverings on elongated articles. To: Chemische Werke Huls A.G. (Germany).

A seamless film as casing for a cable. The casing in the frozen state has been first stretched transversely, then longitudinally and then applied in the same operation followed by a heat treatment to shrink it on.

B.P. 773,547. Resol resins. D. A. Fraser, R. W. Hall, A. L. Raum. To: Distillers Co., Ltd.

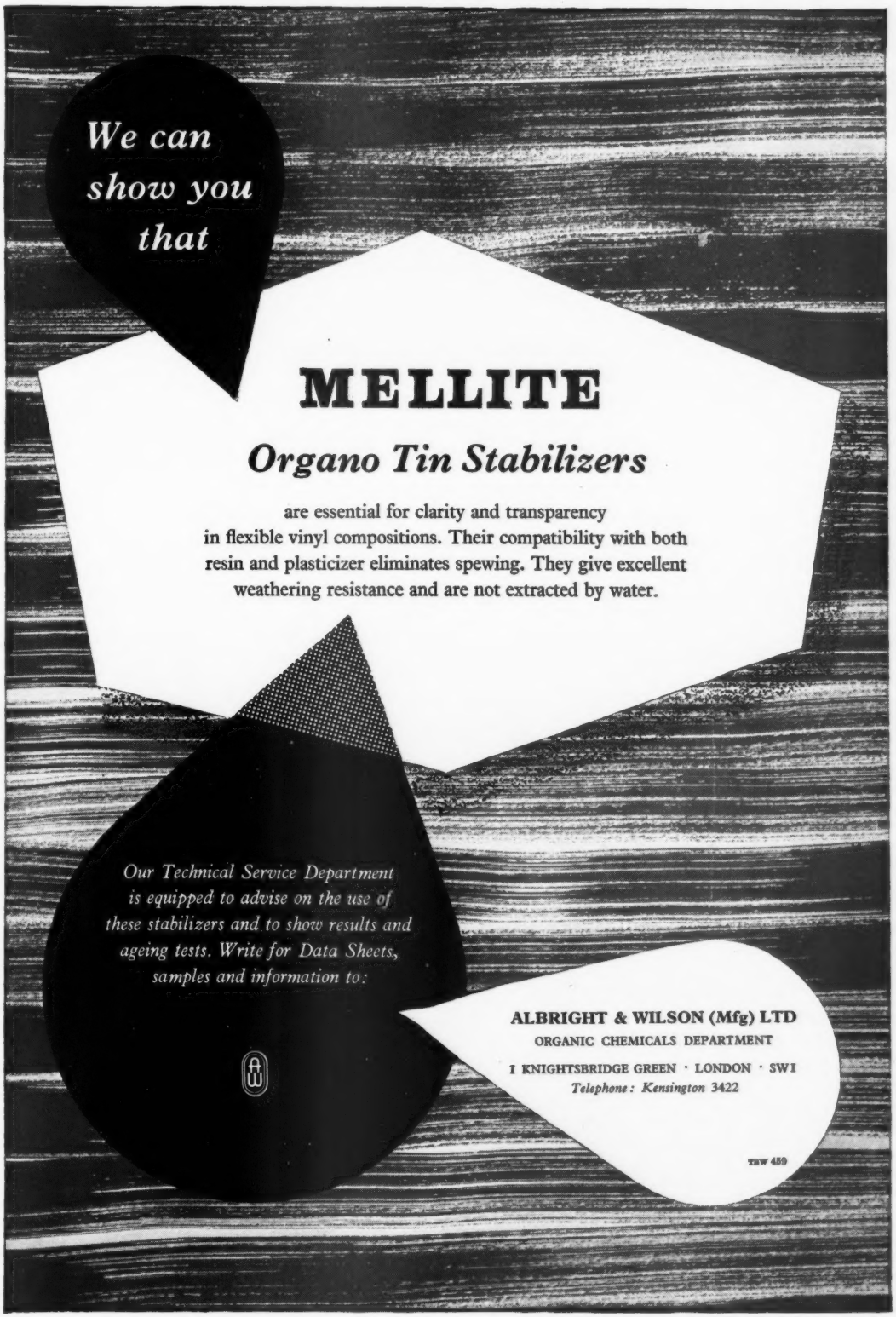
Relates to resol phenolic resins as hot setting adhesives for plywood.

B.P. 773,611. Resol resins. D. A. Fraser, R. W. Hall, A. L. J. Raum. To: Distillers Co., Ltd.

A resol phenolic resin as a hot setting plywood adhesive.

B.P. 773,615. Articles of footwear. J. Naum (France).

The binding of the upper or of straps to a sole made partly or wholly of plastics presents difficulties. By providing upper or straps (for sandals) with fastening loops through which a flexible band is passed and maintaining this band in place at intervals along the periphery of the sole these difficulties have been overcome.


We can show you that
MELLITE
Organo Tin Stabilizers
are essential for clarity and transparency in flexible vinyl compositions. Their compatibility with both resin and plasticizer eliminates spewing. They give excellent weathering resistance and are not extracted by water.
Our Technical Service Department is equipped to advise on the use of these stabilizers and to show results and ageing tests. Write for Data Sheets, samples and information to:
ALBRIGHT & WILSON (Mfg) LTD
ORGANIC CHEMICALS DEPARTMENT
I KNIGHTSBRIDGE GREEN · LONDON · SWI
Telephone: Kensington 3422
TBW 459

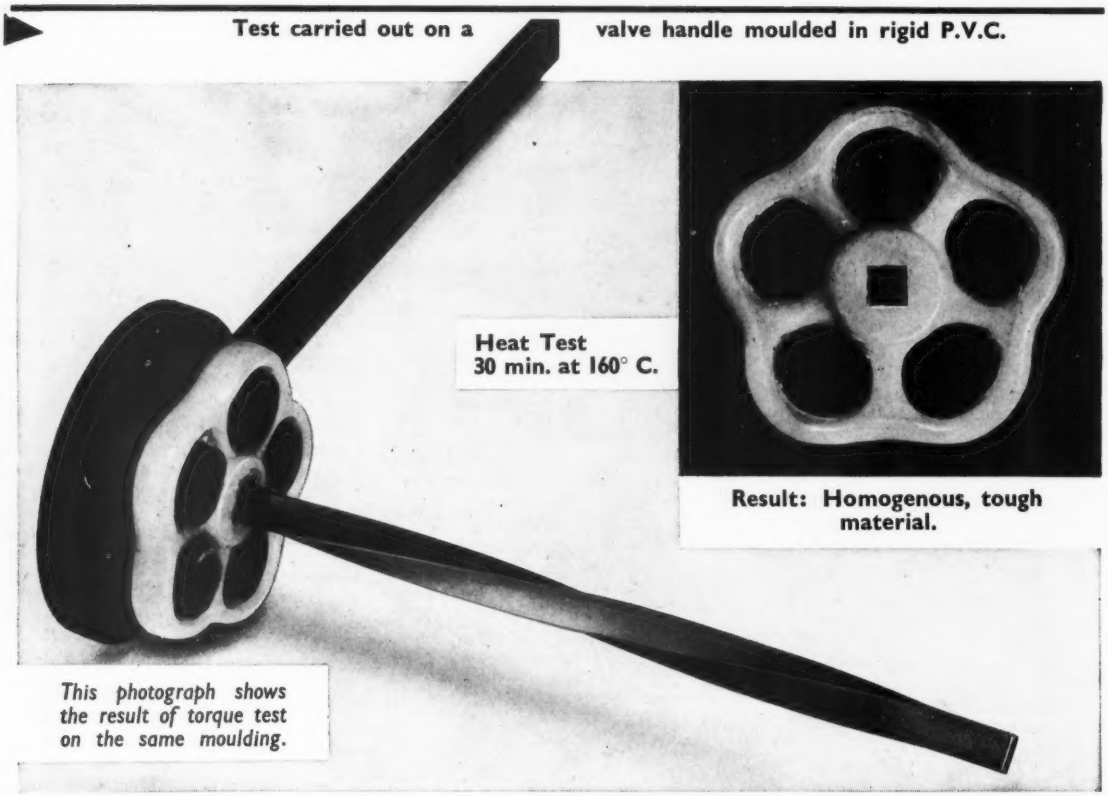
ANKERWERK NÜRNBERG

AUTOMATIC INJECTION MOULDING MACHINES

WITH SINGLE SCREW PLASTICIZING

AND INJECTION UNIT

Test carried out on a valve handle moulded in rigid P.V.C.



Heat Test
30 min. at 160° C.

Result: Homogenous, tough material.

This photograph shows the result of torque test on the same moulding.

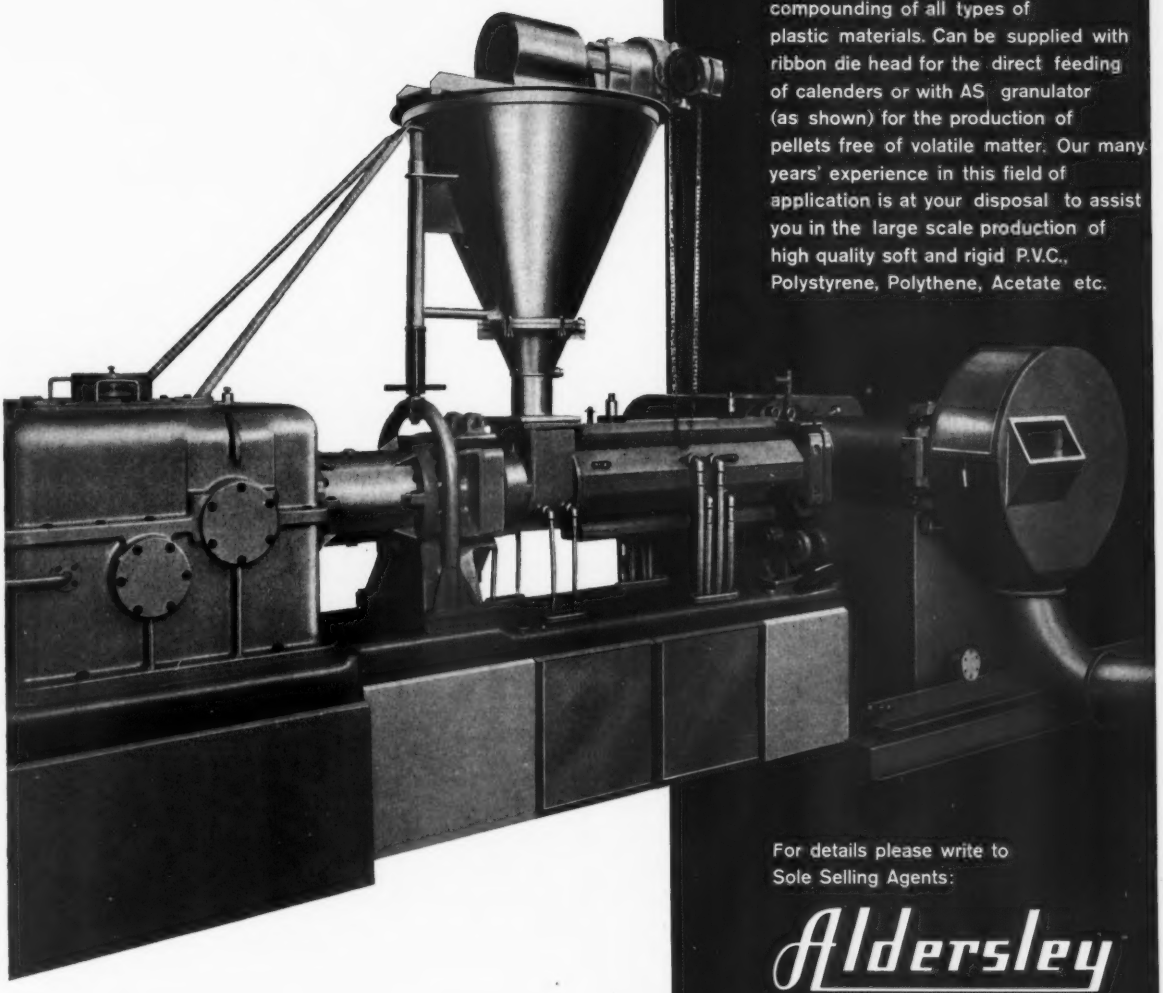
Aldersley AGENCIES LTD., TETTENHALL, WOLVERHAMPTON

Telephone: WOLVERHAMPTON 52071 (3 lines)

BUSS Ko-Kneader

List System

For the continuous mixing and compounding of all types of plastic materials. Can be supplied with ribbon die head for the direct feeding of calenders or with AS granulator (as shown) for the production of pellets free of volatile matter. Our many years' experience in this field of application is at your disposal to assist you in the large scale production of high quality soft and rigid P.V.C., Polystyrene, Polythene, Acetate etc.



For details please write to Sole Selling Agents:

Aldersley

Agencies Ltd.
Tettenhall, Wolverhampton
Telephone: Wolverhampton 52071
(3 lines)
Manufacturers:
BUSS LTD., BASLE/SWITZERLAND

Manufacturers:
BUSS LTD., BASLE/SWITZERLAND

A.M.C. 422

MANUFACTURED UNDER PLASKON LICENCE

For Electrical Insulation at High Humidities

GRANULAR

SELF-EXTINGUISHING

ULTRA HIGH SPEED MOULDING

HEAT AND CHEMICAL RESISTANT

SUPERIOR DIMENSIONAL STABILITY

PLASKON ALKYD MOULDING COMPOUNDS, originally developed with such outstanding success for high electrical insulation work in the United States, are now manufactured under licence in England by RESINOUS CHEMICALS LIMITED. Samples gladly forwarded upon request.

RESINOUS CHEMICALS LTD. RCL BLAYDON, CO. DURHAM

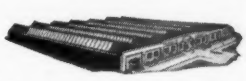
Phone : Blaydon 347-8 Grams : Reschem, Blaydon-on-Tyne

not quite as simple as it looks . . .

This weight is a simple looking article and all it has to do is to rest upon a pack of record cards to ensure that they are fed regularly through one of the International Business Machines. But it was not quite as simple as that. The weight had to be correct and the appearance and finish worthy of the machine in which it was to be used.

After consultations with our customer some alterations in design were made which facilitated the production and reduced tooling costs.

It is illustrated here by the courtesy of Messrs. International Business Machines (U.K.) Limited, who entrust us with the production of many of their moulded articles, because they know that our efficient and extensive plant enables us to give them quality and accuracy, as well as adequate delivery.



Walsall Works (Bescot Crescent)

Victoria Works (Summer Lane)

Walsall Works (Eldon Street)

Cheapside Works

E. ELLIOTT LIMITED
315 SUMMER LANE,
BIRMINGHAM 19
Tel.: ASTon Cross 1156/7/8/9

E. Elliott Ltd

The Plastic Moulders with the Engineering Background

HERCULES

is the name that immediately comes to mind in matters of Quality and Service concerning . . .

CELLULOSE

ACETATE

The exact grade for your requirement can be determined and supplied and you are protected by the Hercules standard of quality.
Hercules Technical Service Department is available at all times on matters either technical or commercial.
For full information about Hercules Cellulose Acetate write—

Cellulose Products Department

HERCULES POWDER COMPANY LIMITED

140, PARK LANE, LONDON, W.1

NEW MATERIALS

Aluminium — plastic mixture. — By mixing aluminium with various plastics in appropriate quantities, *marked improvements* can be effected in the mechanical properties of the plastic, especially as regards impact strength. In order to obtain the desired results it is essential that the plastic should "wet" and adhere to the aluminium and that it should not react chemically. The metal particles constituting the addition must have dimensions not smaller than 0.17 mm. and it is preferable if the particle size of the metal addition be above 0.14 mm. In most cases the best results are obtained with metal particles of dimensions 0.3 to 1.5 mm. With polystyrene an impact strength of 4 cm.kg/cm² can be achieved with comparatively coarse aluminium particles up to a volume in addition of 32.4%. The product has a softening point of about 6° C. higher than plain polystyrene. Data are also given for aluminium addition to phenolic resins. Aluminium-plastic composites *are not subject to accumulation of static charges.* They may under appropriate conditions be injection moulded and may be machined readily. They may also be produced in a porous form. (*Revue de l'Aluminium*, 1956/Dec./1165.)

Reproduced from "PLASTICS" June, 1957

We supply
from our own production

ALUMINIUM GRANULES

to every desired
MESH SIZE

ENQUIRIES TO:—

OAKLAND METAL COMPANY LIMITED

142 NEW BOND STREET, LONDON, W.1. · Tel. GROsvenor 5241/4 · Telex 2-3330

WELL-KNOWN FIRM OF METALLURGISTS

(SPECIALISTS IN THE MANUFACTURE OF GRANULATED ALUMINIUM)

Would like to enter the plastics field

AVAILABLE

MODERN FACTORY *(At present empty)* 30,000 Square Feet with over 3 acres of Freehold ground for further development. Light, water, steam central heating, compressed air, etc., laid on. Ample male and female labour could be recruited.

★ We would like to co-operate with a responsible firm or individual to make best possible use of these facilities.

ENQUIRIES TO
Mr. KLEIN
Managing Director

OAKLAND METAL COMPANY LIMITED

142 NEW BOND STREET, LONDON, W.1. · Tel. GROsvenor 5241/4 · Telex 2-3330

PEVIKON KL-2

faster, more efficient cable insulation

Pevikon KL-2 is a straight polyvinyl chloride material which is used for electrical wire and multicore cable insulation. Non-hygroscopic, odourless, tasteless and non-toxic, Pevikon KL-2 has an exceptionally short gelling time, is easy to work up, allows high outputs from ordinary processing plant, and has excellent electrical properties.

Immediate delivery.

FOSFATBOLAGET, STOCKHOLM 5. STOCKHOLM SUPERFOSFAT FABRIKS AB, SWEDEN

All enquiries: GUEST INDUSTRIALS LTD, Raw Materials Division, 81 Gracechurch St., London, E.C.3. Tel: MANsion 5631
Cables: GUESTIND LONDON

Fabricators of all Thermoplastic Materials *

* VACUUM FORMING EXPERTS

* Consult us with confidence, knowing that our experience is at your service.

THE GENERAL CELLULOID COMPANY LTD.

206 HANWORTH RD. · HOUNSLOW · MIDDLESEX · Tel.: HOUNSLOW 1108 (3 LINES)

structural plastics? high strength mouldings?

ask Artrite!

The Artrite range of resins and compounds includes the right material for every purpose:—

For compression moulding

Glass fibre filled polyester putties.

Glass fibre filled phenolic moulding powders.

Polyester compounds formulated for use with glass fibre preforms.

For injection moulding

Glass fibre filled polystyrene.

For lay-up moulding

Fully formulated polyester compounds.

Comprehensive range of polyester resins.

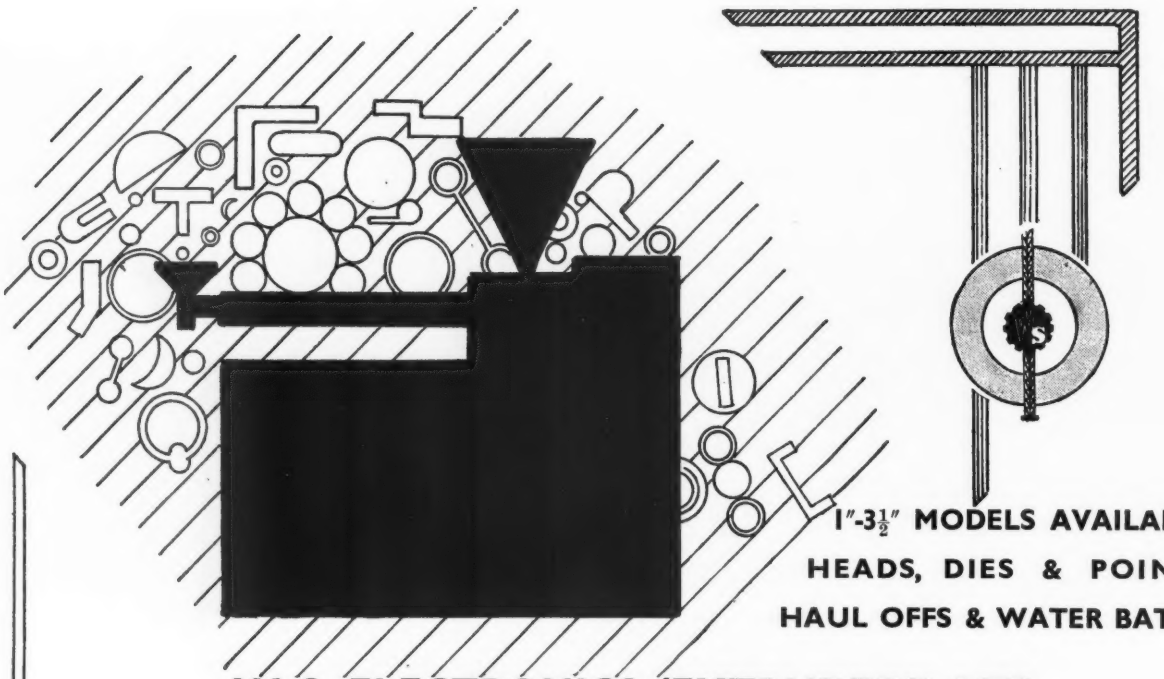
Why not make use of Artrite's expert staff and fully equipped laboratories for the best advice on moulding methods and materials.

AR

ARTRITE resins limited

Kingsway Chambers, 44-46 Kingsway, London, W.C.2. HOLborn 3138.

The right materials for every purpose—the right advice on every application.



1"-3½" MODELS AVAILABLE
HEADS, DIES & POINTS
HAUL OFFS & WATER BATHS

W. S. ELECTRONICS (EXTRUDERS) LTD.
44 BRUNEL ROAD · EAST ACTON · LONDON · W.3
PHONE: SHEPHERDS BUSH 7601 (10 LINES) GRAMS: SELTRIC, EALUX, LONDON

When its Moulds and Moulding

We mould in all Thermoplastic materials up to 16 ozs.

We are pioneers and specialists in injection moulding of P.V.C. and Polythene.

THIS IS OUR SERVICE
We advise on design and development.
We manufacture the mould.
We mould to quality precision standards.
'phone SUNnyhill 0181/2/3

IP

INITIAL PLASTICS LTD.
Brent Bridge, London, N.W.4

SOFT PLASTICS

OXYTHENE

VINYL PLASTISOLS

PVC PASTES have all the answers!

CLOSE VISCOSITY CONTROLLED · GOOD SHELF LIFE · TOP CLARITY · VACUUM PROCESSED, AIR FREE OXYTHENE PASTES IN 36 ATTRACTIVE COLOURS · CHEMICAL RESISTANCE · LIGHT AND HEAT FAST · OPAQUE OR TRANSLUCENT · BRING VERSATILE VINYL PASTES INTO EVERY INDUSTRY

We can answer your problem with OXYTHENE :

PLASTISOLS	(FLOWABLE PASTES) for coated textiles, dip forms, dip coating, casting, slush moulding, spraying, electrical insulating, wire coating, centrifugal or
or	rotational moulding, upholstery, wearing apparel, tent fabrics, flooring, luggage, book covers, table covers, awnings, wall coverings, packaging.
FOAMOSOLS	(EXPANDED PASTES) for vinyl sponge materials, flexible mountings, shock-
or	proof padding, cushions, thermal insulations, gaskets.
PLEXIGELS	(PUTTY-LIKE PASTES) for cold dipping without pre-heating, modelling or forming without moulding, trowelling or can be extruded, calendered or moulded
or	on low-pressure cold processing machinery prior to gelation.
ORGANOSOLS	(NO-DRIP PASTES) substituted for plastisols where harder, tougher films are desired and where lower viscosities are necessary. Flexible coatings, no-drip
or	coatings, spread coatings of fabric and unsupported film, wire articles.
SPRAYSOLS	(SPRAYABLE VINYLS) for spray or brush coating chemical plant, tank linings, exhaust fans, moth balling, table tops, applying corrosion proof linings of all types.

After fusion OXYTHENE pastes form leather-like solids or flexibles of outstanding resistance and toughness—inert to most corrosives.

PROBE THE POSSIBILITIES OF Versatile Vinyl PASTES

in consultation with

HORWITCH SMITH & COMPANY LIMITED

Paste and Polymer Division

42, Lower Loveday Street, BIRMINGHAM 19

Phoenix Rubber Co. Ltd.

& Phenco Ltd.

91 BISHOPSGATE, LONDON, E.C.2
Tel.: LONDON WALL 1622

WORKS 2K
Buckingham Avenue
Trading Estate
SLOUGH
Bucks.
Telephone
Slough 223079

Manufacturers of

PLASTIC

FLOORING IN CONTINUOUS ROLLS AND TILE FORM

COMPOUNDING to specification

REGENERATED thermo-plastic materials

ANTI-STATIC FLOORING FOR USE IN HOSPITALS AND ORDNANCE FACTORIES

SHEETING in all thicknesses and colours, plain and fluted.

TAPE for packaging and cable wrapping

FJE for the LATEST in PLASTICS MACHINERY!

After nearly 50 years in the sheet metal industry, our reputation for the finest—and latest in Plastics Machinery from the Continent is now being rapidly established.

We can supply many machines of exceptional performance and value:—

CLICKING PRESSES
FOIL BENDERS
VACUUM FORMING MACHINES
VACUUM PACKAGING MACHINES
HORIZONTAL TRIMMING MACHINES
PLASTIC SHEET FOLDERS
BOX MAKING MACHINES
EDGE CURLING MACHINES
WELDING PRESSES
ELECTROSTATIC FLOCKING MACHINES
FOOT PRESSES
NOTCHING MACHINES
GUILLOTINES

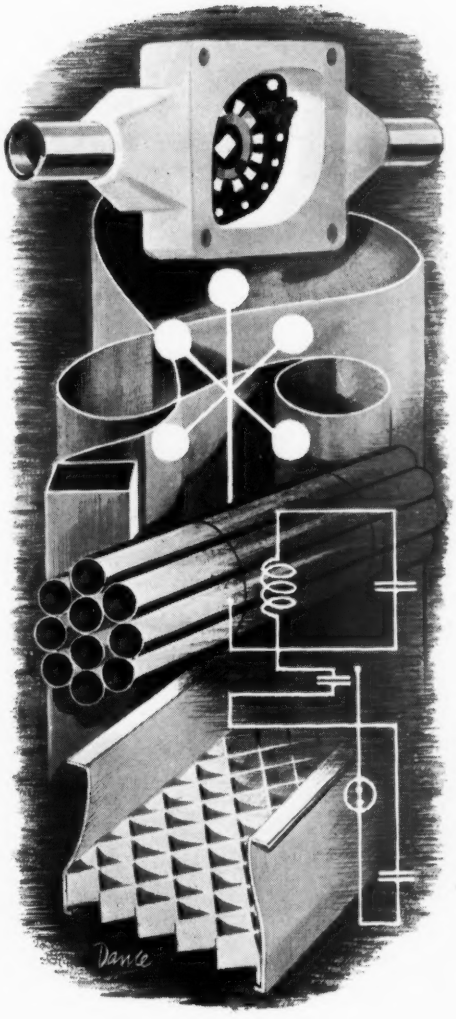
The illustration shows MODEL H 200 VE, one of the famous Stübbe range of precision INJECTION MOULDING MACHINES. Fully automatic and incorporating many new features, they are capable of moulding objects of great strength and uniform structure, including UNPLASTICIZED RIGID P.V.C. up to 10oz.

F.J. Edwards Ltd
(Plastics Machinery Division)

Edwards House, 359-361 Euston Road, London, N.W.1
Telephones: EUSton 4681 (7 lines), 3771 (4 lines). Telegrams: Bescotools Norwest London.

Lansdowne House, 41 Water Street, Birmingham 3
Telephones: CENtral 7606-8. Telegrams: Bescotools Birmingham 3.

Elco Plastics Ltd.

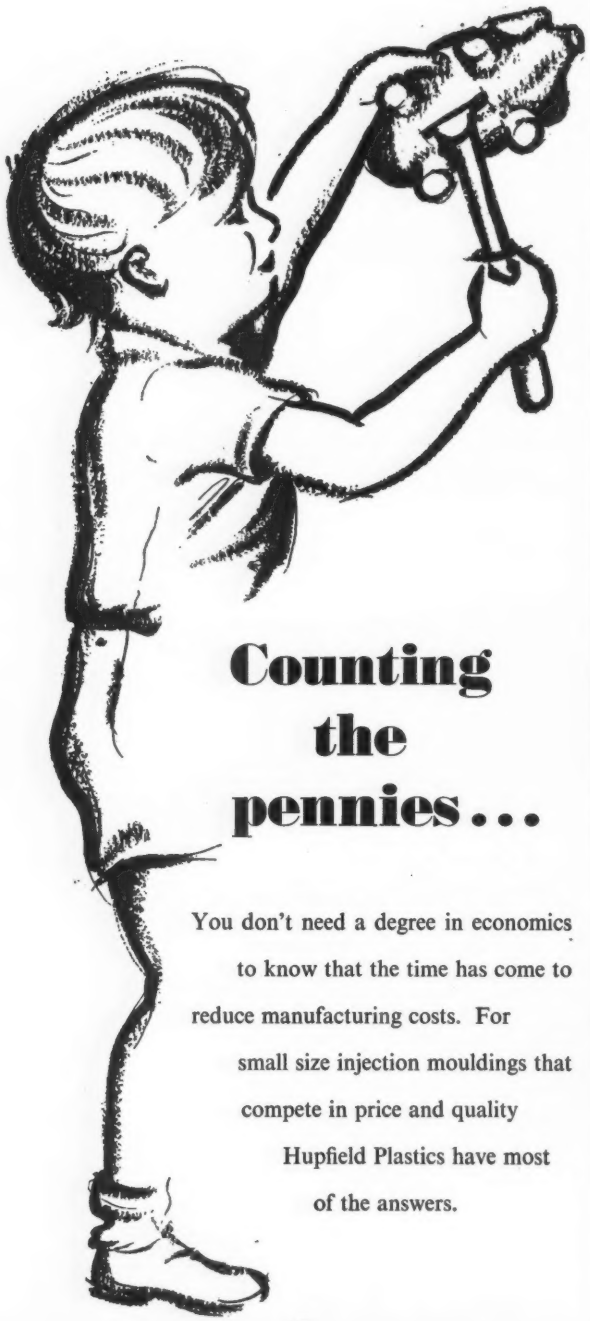


Plastic Mouldings
Assemblies
"Lamtuf"
S.R.B.P. Tubing
Electronics
L.F. + H.F. Assemblies and Sub-assemblies
Windings
Lighting Louvres and Extrusions
"Elcoplas"
"Clipluve"

DESBOROUGH PARK ROAD, HIGH WYCOMBE, BUCKS. TEL : HIGH WYCOMBE 3554-1921-1922

A.I.D. APPROVAL NO. 69/40 I.F.V. APPROVAL NO. AV0078/53/D A.R.B. APPROVAL NO. A1/4905/56

Modern Toolroom and Design Staff on Premises



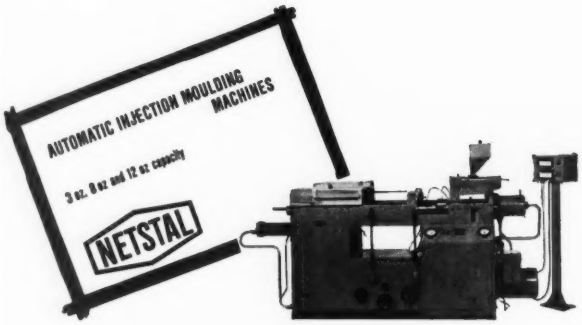
Counting the pennies...

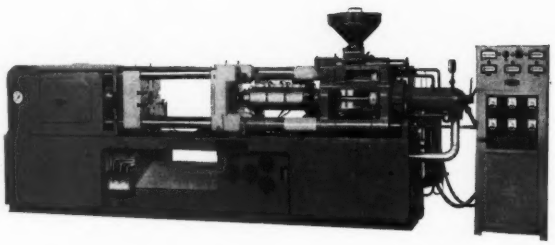
You don't need a degree in economics to know that the time has come to reduce manufacturing costs. For small size injection mouldings that compete in price and quality Hupfield Plastics have most of the answers.

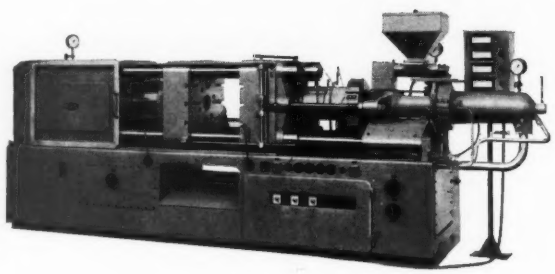
HUPFIELD PLASTICS
Limited

for
INJECTION MOULDINGS

47 OLD CHURCH LANE, STANMORE
MIDDLESEX
Telephone: GRImsdyke 305







SOLE U.K. AGENTS :

GRILON & PLASTIC MACHINERY LTD
47, VICTORIA STREET, LONDON, S.W.1
Telephone : Abbey 7538

MACHINE FACTORY & FOUNDRY LTD
NETSTAL SWITZERLAND

CRYSTIC AND MARCO

Pioneer *Polyesters*

Scott Bader have been manufacturing polyester resins since 1946 and we are proud of the prominent part which we and our customers have taken in developing the Glass Reinforced Plastics industry.

Scott Bader polyesters are made under ideal conditions at our Wollaston Garden Factory in a plant which has been specifically designed for the production of consistent high quality polyester resins.

A team of young and energetic research workers ensure that **Scott Bader** continues to lead in all technical matters connected with polyester resins.

Technical service staff specially trained in the handling of polyester resins are always ready to give prompt and helpful assistance to customers.

Scott Bader polyester resins are being used throughout the world.

SCOTT BADER & CO LTD

Polyester Division

Wollaston Wellingborough Northamptonshire Telephone Wollaston 262

London Office—109 Kingsway London WC2 Telephone HOLborn 3691

Makers of
Better Plastics
rely on

VICTOR BLAGDEN

CHEMICALS

for the Plastics Industry

PHENOL 39/41°

META CRESOL

Manufactured by
P. R. CHEMICALS LTD., Silvertown

FORMALDEHYDE

Manufactured by
The B.N.R. COMPANY, Barking

Enquiries to the Sole Selling Agents :—

VICTOR BLAGDEN & CO. LTD.
PLANTATION HOUSE, MINCING LANE, LONDON, E.C.3
Telephone: MANsion House 2861 (6 lines)
Telegrams: BLAGDENITE FEN, LONDON
Norwich Union Building, City Square, Leeds. Telephone: 28236

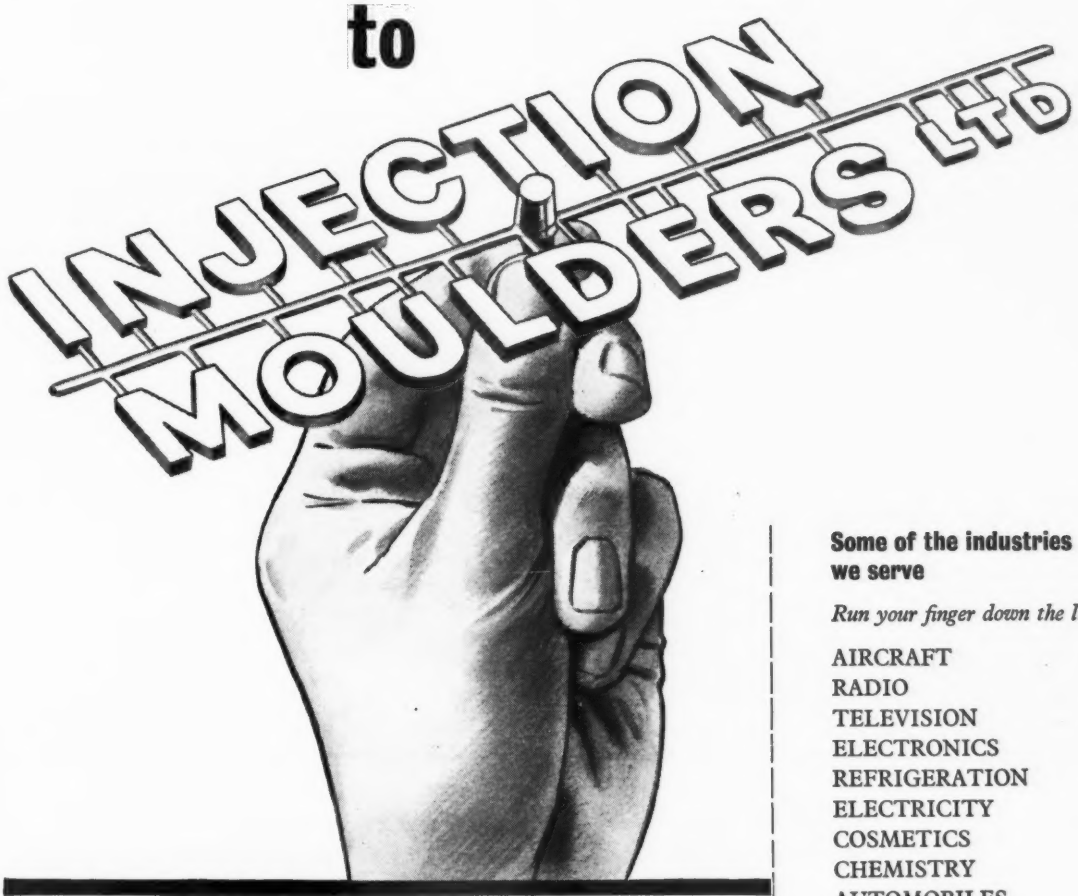
the junior rotary cutter

This machine will meet all demands for a really robust yet small granulating machine with a high performance. The Junior is provided with a large granule collecting bin and the rotor is driven through V-belts by a 1 H.P. motor mounted on the framework. The machine is quiet in operation and has been designed to ensure easy cleaning and maintenance. If desired the unit can be supplied suitable for bench or mobile mounting. The Junior Rotary Cutter is produced by specialists in the cutting of plastics and is one of the range of well-known Masson Rotary Cutters. Please write for further details.

BLACKFRIARS ROTARY CUTTERS LTD.

Blackfriars House, New Bridge St., E.C.4
Telephone: FLEet Street 6383

Bring your moulding projects to



You'll be in very good company, for many big industrial "names" come to us for advice and help. We mould for practically every industry you've ever heard of (and some you haven't!) – in cellulose acetate, diakon, methyl-methacrylate, polystyrene, polythene, nylon, etc.

We'll be only too happy to discuss *your* particular injection moulding difficulties.

Some of the industries we serve

Run your finger down the list:

AIRCRAFT
RADIO
TELEVISION
ELECTRONICS
REFRIGERATION
ELECTRICITY
COSMETICS
CHEMISTRY
AUTOMOBILES
TOYS
PHOTOGRAPHY
TELEPHONES
ENGINEERING
BUILDING
SPORTS
OFFICE EQUIPMENT
FANCY GOODS
SHOP FITTING
HOUSEHOLD WARES
ETC., ETC.

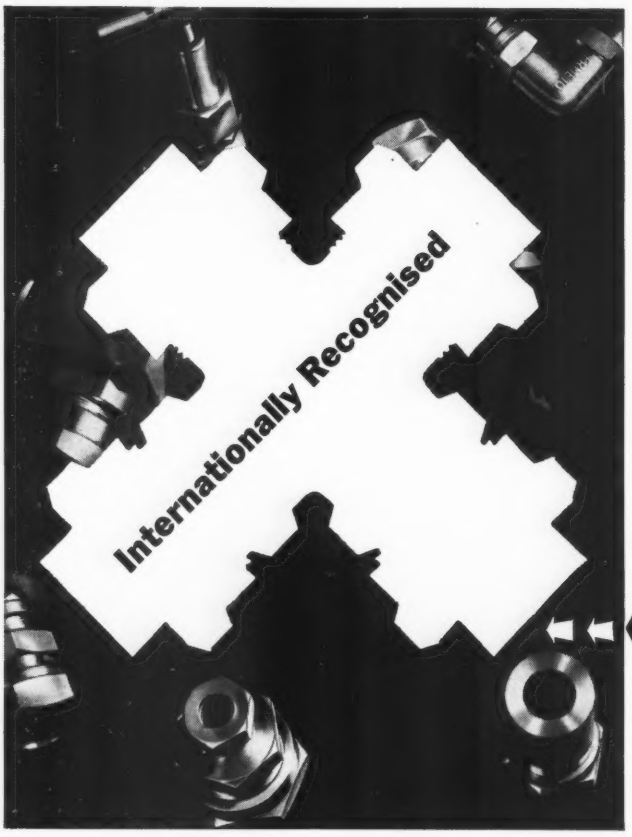
INJECTION MOULDERS *Ltd*

Specialists in thermo-plastic moulding for all industries.

WESTMORELAND ROAD, LONDON N.W.9

Telephone: COLindale 8868/9 8860 *Telegrams:* INJECMOULD HYDE LONDON

IM60R



ERMETO fittings are the internationally recognised method of coupling high pressure pipe lines. Enormous numbers are in use throughout the world.
Supplied in mild steel, stainless steel, brass, bronze and aluminium for all pipe sizes, standard and non-standard up to 2″ o.d.

A wide range of valves also available.
Catalogues on request.

ERMETO

BRITISH ERMETO CORPORATION LTD
Beacon Works, Hargrave Road, Maidenhead
Tel: Maidenhead 2271-4

Moulds by Experts.

TOP PORTION OF 36 IMP. STRIPPER PLATE MOULD FOR 2¼″ CAP CLOSURE WITH STANDARD JAR THREAD.

MOULDINGS ARE SPRUNG OFF THREADED PUNCH.

★ H.B.SALE LTD.

PROGRESS WORKS, SUMMER LANE, BIRMINGHAM, 19

Established 1863 TEL.: CEN. 5661/3 GRAMS.: SALE, B'HAM Member of G.T.M.A

TP DUNSTABLE

NINETEEN THIRTY TWO — NINETEEN FIFTY SEVEN

YEARS
SERVICE TO INDUSTRY

Vacuum Formings

Injection Mouldings

Compression Mouldings

Glass Reinforced Sheets and Tubes

Glass Reinforced Mouldings

Durestos Components

Sheet Fabrications

Precision Machinings

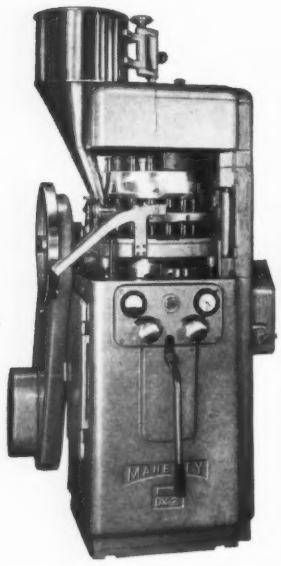
Pioneers in Modern Plastic Techniques

THERMO-PLASTICS LTD
AND ASSOCIATE COMPANIES
Moulders and Fabricators of ALL Plastic Materials

DUNSTABLE — BEDS

Telephone: DUNSTABLE 1444 (6 lines) *Telegrams:* THERMOPLASTICS, DUNSTABLE

MANESTY



DX2 ROTARY TABLET MACHINE

a NEW MODEL

FOR "SLUGGING" or PREFORMING

This machine is an addition to the Manesty range of rotary tablet machines and is particularly useful for "slugging" or preforming on account of its rugged construction, increased depth of fill and suitability for tablet diameters up to 1¼ in. Two types are available—one with 13 die stations up to 1¼ in. diameter, the other with 16 die stations up to 1 in. diameter. Other features are: **Hydraulic overload device; Direct reading pressure gauge; Variable speed drive; Hopper with cut-off slide; New type cams; Built in Dust Extraction Nozzle; Completely enclosed.**

SPECIFICATION

Output (13 station model)	**143/286 per minute.**
Output (16 station model)	**176/352 per minute.**
Maximum diameter (13 station model) ...	**1¼ in.**
Maximum diameter (16 station model) ...	**1 in.**
Maximum depth of fill (both types) ...	**1 1/16 in.**
Maximum working pressures (total) ...	**10 tons.**
Horse power of motor	**3 h.p.**

Full details on request.

MANESTY MACHINES LTD., 41, Evans Road, Speke, LIVERPOOL 19

Telephone: HUNTS CROSS 1972. *Telegrams:* MANESTY, LIVERPOOL, 19

TABLET MACHINES · PUNCHES AND DIES · MIXERS · GRANULATORS · COMMINUTORS · CONE MILLS

A point worth

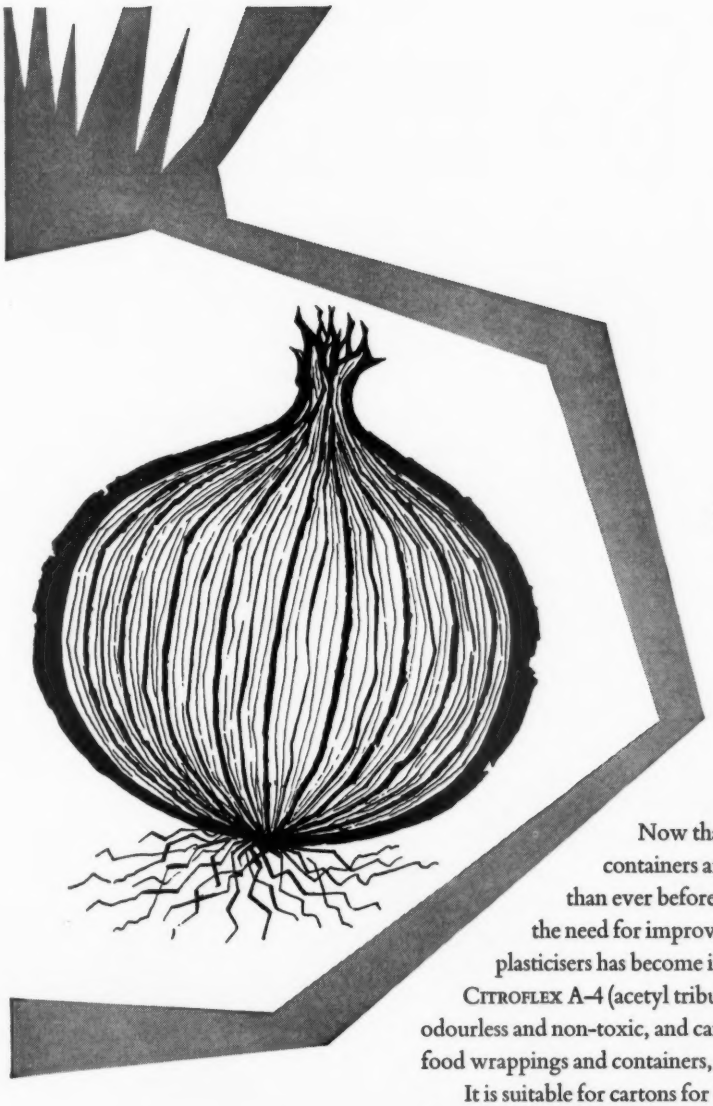
PUNCHING home . . .

Even tricky plastic shapes like these present no problems to Tenaplas—the pioneers of plastic extrusion in Britain. A very wide range of P.V.C. and Polythene shapes is held constantly in stock (write for fully-detailed catalogue). Any other size or shape you may require will be made promptly, without fuss, if you will send a drawing or blueprint. And if there's any other way in which we can advise or help, please write or 'phone.

TENAPLAS LIMITED

UPPER BASILDON, NR. PANGBOURNE, BERKSHIRE
Tel: Upper Basildon 333 6

LONDON OFFICE: 37 THURLOE STREET, LONDON, S.W.7
Tel: Knightsbridge 5211 7



Safe . . .

and

odourless

Now that plastic wrappings and containers are being used to a greater extent than ever before in the packaging of foodstuffs, the need for improved, odourless and non-toxic plasticisers has become increasingly important.

CITROFLEX A-4 (acetyl tributyl citrate) is completely odourless and non-toxic, and can be used in the manufacture of all plastic food wrappings and containers, including those intended for fatty foods.

It is suitable for cartons for dairy produce, bottle caps for soft drinks, seals for preserving jars, and many other applications.

CITROFLEX A-4

PFIZER CITROFLEX*

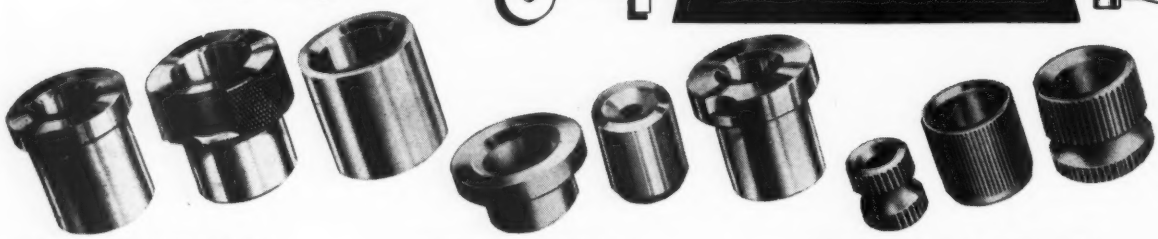
PFIZER LTD · FOLKESTONE · KENT

Distributors: Kingsley & Keith Ltd., 110-112, Victoria Street, London, S.W.1. *Phone:* TATe Gallery 4092

* *Trade Mark of Chas. Pfizer & Co., Inc.*

Pfizer

Increased production with Grip JIG BUSHES



FOR GENERAL ENGINEERING

Made to British, Continental and American specifications.

The largest standard stock range in the United Kingdom . . . . plain, headed, serrated, fixed and slip renewable types. Hardened, ground and lapped to the highest standard.

BUSHES FOR PLATE JIGS

Specially developed for jigs made from thin sheet metal, as widely used in the aircraft industry. Full range of bore sizes.

BUSHES FOR GLASS FIBRE JIGS

With the extensive use of glass fibre and laminate plastics in jig construction we have developed a range of special bushes designed to afford the most rigid anchorage, radially and axially. The recessed serrated type for moulded jigs has already been widely adopted and can be supplied in a complete range of bore diameters.

TALBOT TOOL CO. LTD. *Sales Division:* 87 BOROUGH HIGH STREET, LONDON, S.E.1. Phone: HOP 3722

All the year round...

there is a demand for printed plastics, and it increases steadily as more and more trades and industries realise that they cannot do without them. Calendar cards like these are just one example of our very wide scope. We can make anything from sliding or circular calculators to adjustable price tickets or calendar cards—in any shape, any size, any number of colours. The time is sure to come when you need printed plastics; when it does, you can't do better than contact:

EVERY TRADE NEEDS PLASTICS

U.K. PLASTICS LTD.
ESTABLISHED 1911
KINGSTON-BY-PASS, SURBITON, SURREY
Telephone: ELMbridge 2814-5
Telegrams: Celluprint, Surbiton

It will pay you to

investigate

the economies

that

can be made

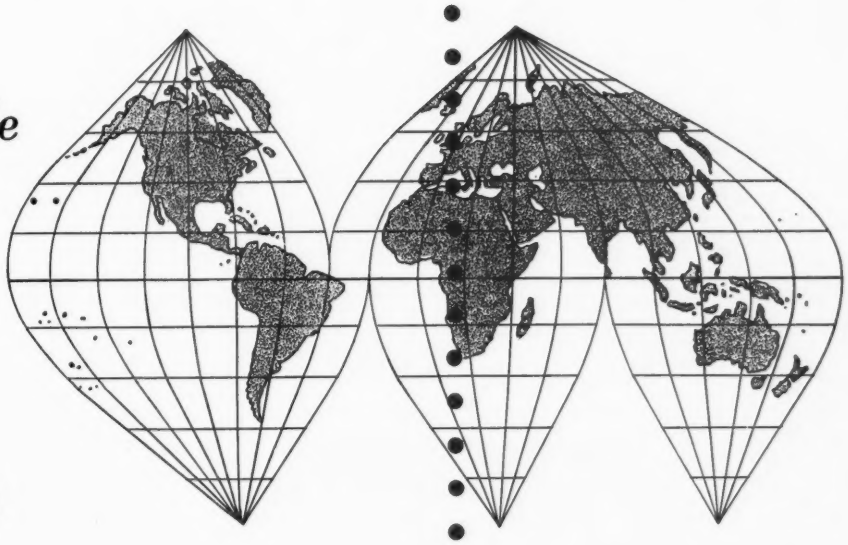
by using

Grist

Reprocessed

P.V.C. Cellulose Acetate,

Polystyrene, Polythene



DOHM LTD. **(Plastics Division)**

167 VICTORIA ST., LONDON S.W.1

Telephone VIC 1414 (8 lines)

ONE OF THE DOHM GROUP OF COMPANIES

Whatever your Product or your Problem

we can produce extrusions of the correct shape, size and colour for your requirements. For the new design you are planning, or the more economical and efficient production of your standard lines get in touch with:—

MELWOOD THERMOPLASTICS LTD
Willoughby Road
Harpenden - Herts
Telephone: Harpenden 300
Grams: Melplas, Harpenden
London Office:
49 LONDON WALL E.C.2
Telephone:
MONARCH 6862
All correspondence to Harpenden

UCC

CHEMICALS FROM COAL

PHENOL:	39.5/41°C
CRESOLS:	60/64% meta content ortho, pure grade A
XYLENOLS:	1.3.5 2.4/2.5 5/7° (specified cuts as required)

Enquiries to :-

UNITED COKE & CHEMICALS COMPANY LTD.

THE UNITED STEEL COMPANIES LTD

(SALES DEPARTMENT 71) 34, Collegiate Crescent, Sheffield, 10

Telephone: Sheffield 63025 Telegrams: 'Unichem' Sheffield

UCC1

HUPFIELD FULLY AUTOMATIC $2\frac{1}{4}$ & $1\frac{1}{4}$ OUNCE CAPACITY INJECTION MOULDING MACHINES

THESE LOW PRICED MACHINES WILL NOT ONLY PERFORM TO THEIR RATING BUT WILL SURPASS IT. WORKING THROUGHOUT THE WORLD, RELIABLY SERVING A MULTITUDE OF INDUSTRIES FROM MASS PRODUCTION OF CONSUMER GOODS TO HIGH PRECISION INDUSTRIAL MOULDINGS. AUTOMATIC, TIME-CONTROLLED MACHINES WITH VARIABLE CONTROLS WHERE NEEDED. PRECISION MADE FOR COMPLETE INTERCHANGEABILITY. BUILT TO SERVE, PERFORM AND LAST UNDER THE TOUGHEST CONDITIONS. BACKED UP BY AN AFTER SALES SERVICE SECOND TO NONE.

WRITE FOR PARTICULARS AND DEMONSTRATION TO:

Plant Installations Ltd., Welton Manor, Nr. Daventry, Northants

TELEPHONE DAVENTRY 257 OR THE LONDON WORKS: HUPFIELD BROS. LTD. WORDSWORTH 4488

P

IN THE FIELD OF

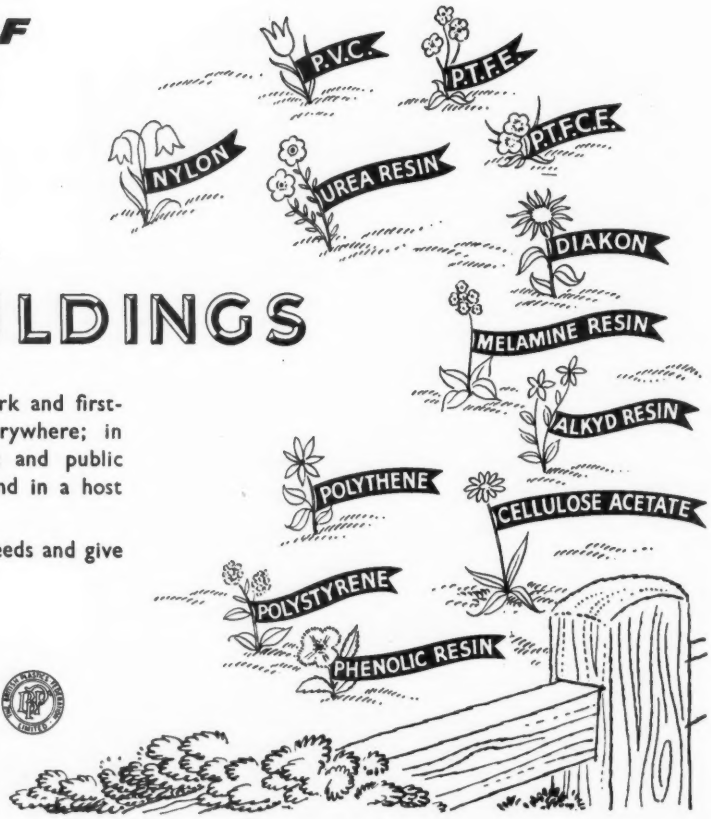
plastics

CONSULT

KENT MOULDINGS

KM have a fine reputation for first-class work and first-class service. Their mouldings are used everywhere; in electrical and radio equipment; in aircraft and public services; in toys, sports and fancy goods, and in a host of other articles.

A KM engineer will gladly investigate your needs and give you reliable advice.



KM KENT MOULDINGS
PROPRIETORS HOLSTED BRANDES LIMITED

FOOTSCRAY · SIDCUP KENT

Tel: Footscray 3333

STEEL-SHAW jacketted

BALL MILLS

with porcelain linings

Successfully used for many years in the plastics industry, Steel-Shaw Ball Mills are your wisest choice for the grinding of plastic powders of all types. Speed, ease of operation, and efficiency, are but some of their attributes, which, from the manufacturer's point of view, mean increased productivity and top-quality products.

Robustly constructed and capable of staunchly withstanding the strain of constant use, Steel-Shaw Mills can be supplied in various sizes and fitted with discharge casings and insulated cooling jackets, if required.

"Steel-Shaw" ball mills are lined with porcelain blocks. Illustrated here with water jacket and discharge casing.

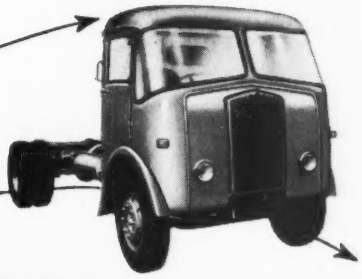
There's a STEEL-SHAW *answer to YOUR problem*

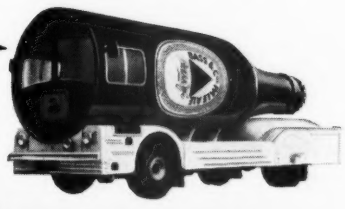
Write now for illustrated brochure

STEELE & COWLISHAW LIMITED

Head Office and Works: DEPT. 27
COOPER STREET, HANLEY, STOKE-ON-TRENT
Phone: Stoke-on-Trent 23333
London Office: 329 High Holborn, W.C.1 *Phone:* HOLborn 6023

scl.2099

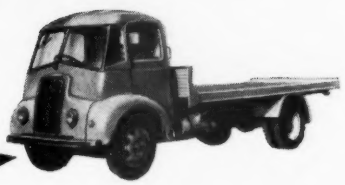




The backbone of reinforced plastics for all kinds of vehicles for all kinds of reasons

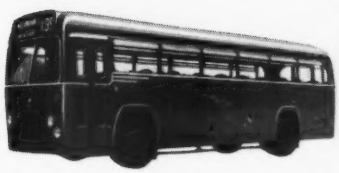
FIBREGLASS
TRADE MARK

Complex sections of FRP can be moulded in one piece. FRP saves weight and it doesn't drum, dent or corrode.



1 Fibreglass Reinforced Plastic cab

2 Fibreglass Reinforced Plastic bonnet, wings and bumper bar



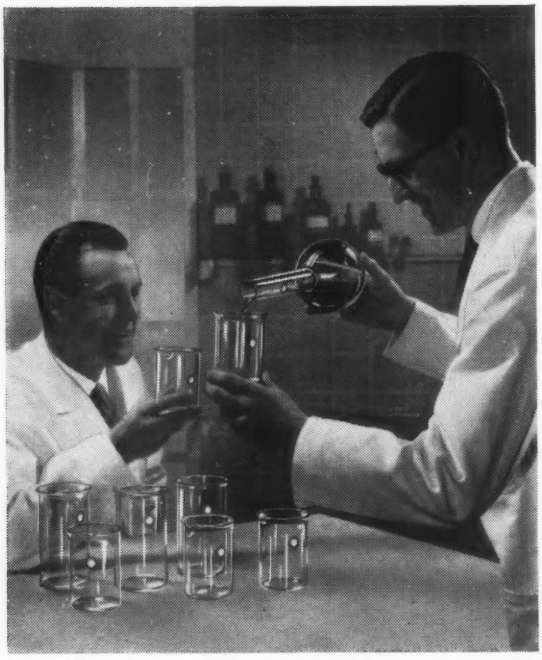
3 Fibreglass Reinforced Plastic body

4 Fibreglass Reinforced Plastic cab

5 Fibreglass Reinforced Plastic front and translucent roof

6 Fibreglass Reinforced Plastic body

FIBREGLASS LIMITED, ST. HELENS, LANCS • ST. HELENS 4224



'PYREX' Beakers and Flasks last longer... because they are stronger

Their basic strength derives from the 'PYREX' borosilicate glass of which they are made, the coefficient of expansion of which is three point two times ten to the minus six, which is so low that it gives the glass an amazing resistance to sudden heat changes.

This means that 'PYREX' Beakers and Flasks can be made much thicker, heavier and more robust, thus protecting them against breakage through careless handling or clumsy washing.

Beakers and Flasks are the items you use most in your lab. They may seem almost common-place, but they cost money, and if you can save fifty per cent on your breakages by using 'PYREX' and nothing but 'PYREX,' then this best of all laboratory glassware becomes a real investment.

● *You'll find 'PYREX' everywhere, from the school to the research institute. Everybody recognises the 'PYREX' quality, and all appreciate the handy carton packs. Insist on 'PYREX' to cut down your breakages and reduce your costs.*

MADE IN ENGLAND PYREX

'PYREX' REGD. TRADE MARK BRAND

PYREX GRIP-SEAL JOINT

THE BRITISH LABORATORY GLASSWARE

JAMES A JOBLING & CO LTD

Wear Glass Works Sunderland

THE ONLY MAKERS OF 'PYREX' BRAND GLASS IN THE UNITED KINGDOM

A complete system available for heat, light and dielectric requirements.

Stabilisers for P.V.C.

* **Basic Lead Carbonate** —specially prepared for P.V.C. Supplied only as dispersed paste with Plasticisers to choice.

Dibasic Lead Phosphite

Tribasic Lead Sulphate

PIGMENTING TYPES

Lead Silicate
Dibasic Lead Stearate
Lead Stearate
Cadmium Stearate
Calcium Stearate
Barium Stearate
Lithium Stearate

TRANSLUCENT TYPES

** With the exception of Basic Lead Carbonate (which is supplied only as dispersed paste) all the above products can be supplied dry or dispersed in plasticisers.*

ASSOCIATED LEAD

MANUFACTURERS LIMITED

SPECIAL CHEMICALS DIVISION, CRESCENT HOUSE, NEWCASTLE UPON TYNE, 1, ENGLAND.

ASSOCIATED LEAD PRODUCTS

SALES INCREASED

by lively "point of sale" displays, like this intriguing figure of Mr. Sword, moulded by KENURE on behalf of Wilkinson Sword Ltd., for distribution to retailers.

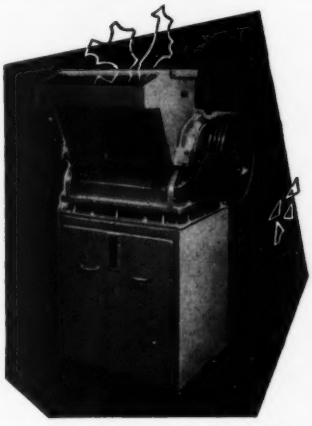
Ask KENURE to quote you for your mouldings. You can be sure of precision work economically executed.

J. F. KENURE LTD.

FAGGS ROAD · FELTHAM · MIDDLESEX

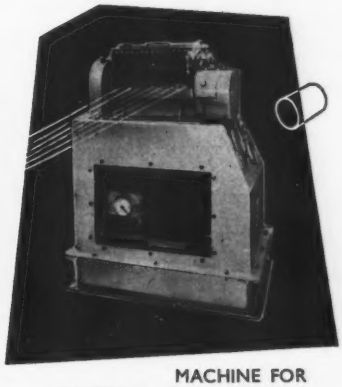
Telephone: Feltham 2604/5/6. Telegrams and Cables: Kenure, Feltham.

CUTTING MACHINES FOR PLASTIC MATERIALS BY FELLNER & ZIEGLER GMBH, FRANKFURT AM MAIN



SCRAP CUTTING MACHINE

BAND DICING MACHINE



MACHINE FOR CUTTING 3 TO 25 STRANDS TO CYLINDRICAL SHAPE

SOLE BRITISH AGENT

Est. 1900

ED. BRAND LTD. (PLASTICS DIVISION)

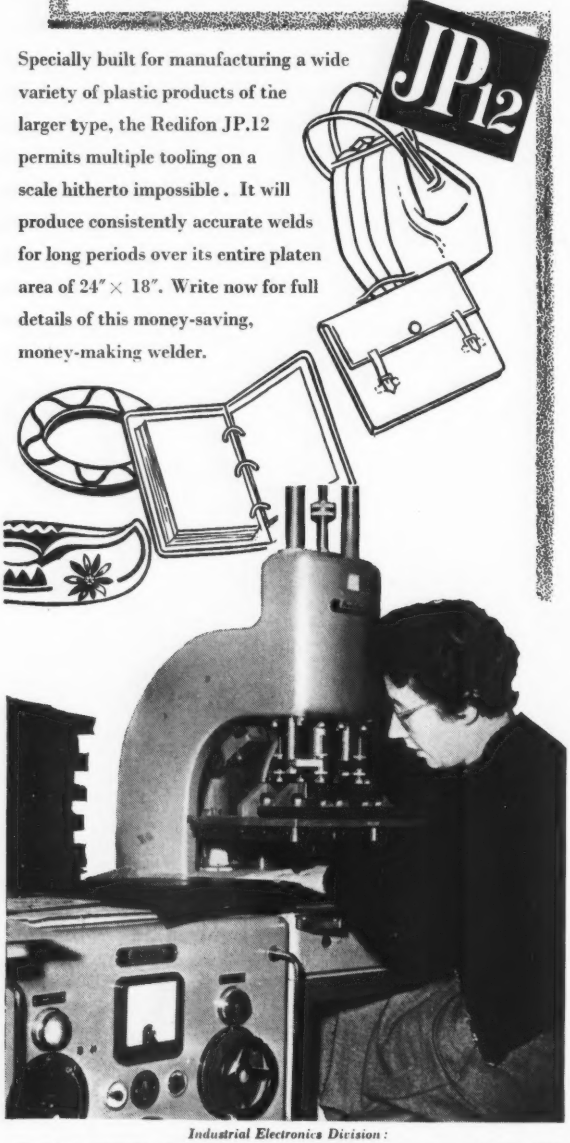
9, St. CROSS STREET, HATTON GARDEN, LONDON, E.C.1

Enter new and profitable plastics markets with THE VERSATILE

Redifon

JP12

Specially built for manufacturing a wide variety of plastic products of the larger type, the Redifon JP.12 permits multiple tooling on a scale hitherto impossible. It will produce consistently accurate welds for long periods over its entire platen area of 24″ × 18″. Write now for full details of this money-saving, money-making welder.



Industrial Electronics Division:
REDIFON LIMITED, BROOMHILL RD., LONDON, S.W.18. Tel: VANdyke 7281
A Manufacturing Company in the Rediffusion Group

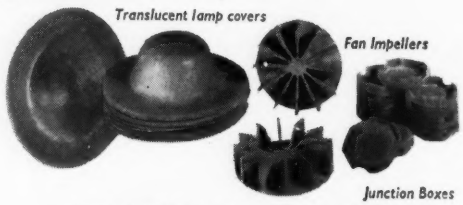
Backed by 20 years' experience in the manufacture of laminated plastics.

PERMALI LIMITED

Now offer

PERMAGLASS

Glass Fibre Reinforced Plastic Materials

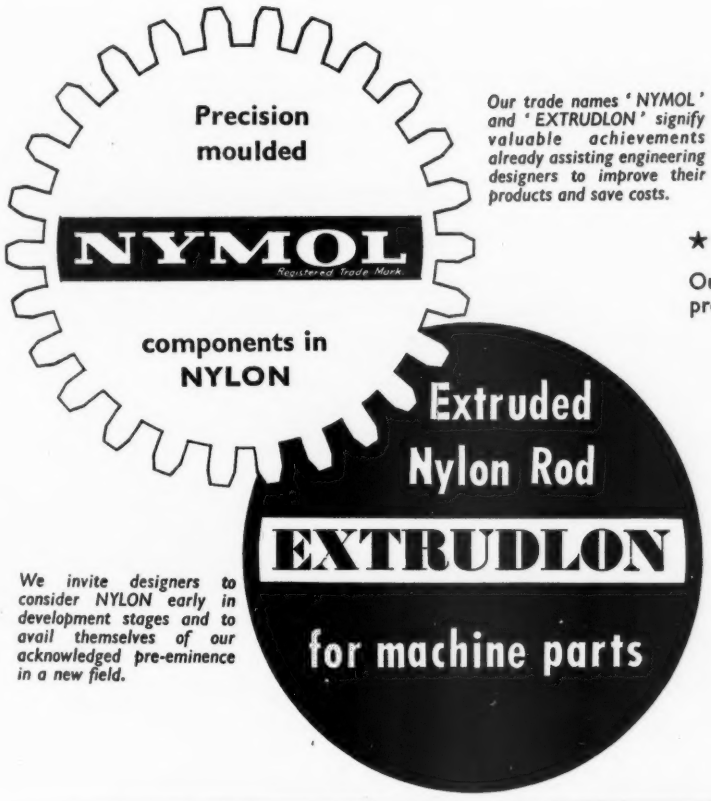


MOULDINGS, SHEETS, TUBES ENCAPSULATION and CASTINGS
based on Polyester, Epoxide, Phenolic and Melamine resins

STRONG, LIGHT, DURABLE, WEATHER and CHEMICAL RESISTANT with GOOD DIELECTRIC PROPERTIES—PERMAGLASS offers WIDE SCOPE in DESIGNS, LOW TOOLING COSTS, RAPID PRODUCTION.

If you are looking for ways to make new and better products at low cost — get in touch with

PERMALI LIMITED
PERMAGLASS DIVISION
GLOUCESTER · ENGLAND
Tel: 24941 · Grams: 'Permali' Gloucester
London Office: 46 Victoria Street, S.W.1 · Tel: ABBey 6494



Our trade names 'NYMOL' and 'EXTRUDLON' signify valuable achievements already assisting engineering designers to improve their products and save costs.

★

Our specialized knowledge always available for problems which 'NYMOL' or 'EXTRUDLON' parts may solve.

We invite designers to consider NYLON early in development stages and to avail themselves of our acknowledged pre-eminence in a new field.

Plastic Engineers Limited

TREFOREST, GLAMORGAN

Telephone: Treforest 2371–2

METALIN LIMITED

MANUFACTURERS OF A LARGE RANGE OF

CADMIUM COLOURS

which are specially suitable for use in the PLASTICS INDUSTRY where...

- **HEAT STABILITY**
- **LIGHT FASTNESS &**
- **STRONG COLOURING POWER**

are of prime importance.

We have specialized in the manufacture of these pigments for many years and the benefit of our experience is at your service.

Telephone : Bletchley 2526

THE CHEMICAL WORKS, BLETCHLEY, BUCKS

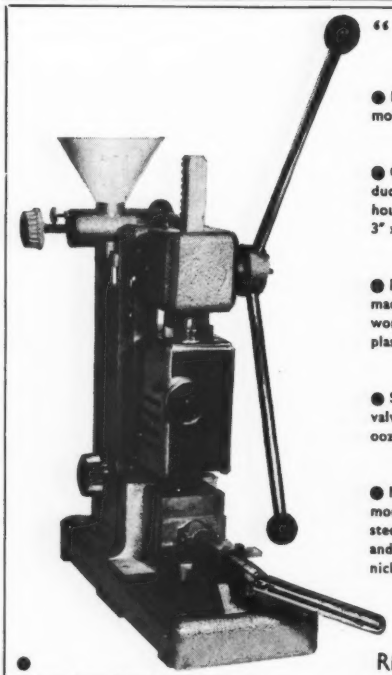
Experienced Hands

When the job calls for precision moulding in polythene, put your trust in experience. We at Telcon have over a century's experience of plastics moulding behind us. In the hands of Telcon technicians many of yesterday's fantasies have become today's facts. This flair for achieving the once-impossible, and our long familiarity with the techniques of plastics moulding, could be working for *you*. If your production problem can be solved by plastics—call in Telcon.

TELCON
MOULDING SERVICE

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO LTD
PLASTICS DIVISION, FARNBOROUGH WORKS, GREEN STREET GREEN, FARNBOROUGH, KENT. *Tel: Farnborough (Kent)* 3585
Export enquiries to: MERCURY HOUSE, THEOBALD'S ROAD, LONDON, W.C.1. *Tel:* HOLborn 8711

"PEPCO"



- Bench-type injection moulding machine.
- Capacity ⅛ oz. Production rate 120 per hour. Mould dimensions: 3" x 3" x 2".
- Most versatile machine suitable for working all thermoplastics including *nylon*.
- Special "non-drip" valve fitted, preventing oozing from the nozzle
- Most comprehensive mould service in stainless steel, nickel chrome steel and electro-formed hard nickel tools.

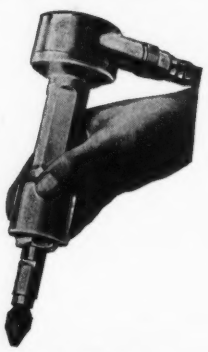
It is with considerable pride that we present our new model—an efficient bench-type machine which provides the answer to many day-to-day problems in industry.
The simplicity of operation, coupled with the low cost of moulds, makes this the most versatile machine of its kind on the market.

Ring TER 9648 for particulars

Manufactured by
PEPCO LTD.
21, SKINNER ST., E.C.1

AJAX

Air Turbine
HAND GRINDERS
FOR YOUR MOULDS



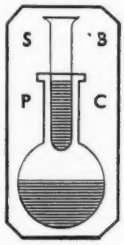
AJAX JUNIOR
Weighs only 8 oz. Speed approx. 90,000 R.P.M. For Grindstones ⅛" to ¼" dia. Sturdy Spindle Collet bored for ¼" dia. shanks. Air Pressure required 50-100 lbs./sq. in.

Leaflets P2 and P3 on request.

Please state Air Pressure when ordering.

AJAX III
Powerful, yet easily handled. Speed approx. 50,000 R.P.M. For Grindstones ¼" to ½" dia. Collet bored for 6 mm. or ¼" dia. shanks. Air Pressure required 50-100 lbs./sq. in.

BRIGGS BROS (ENGINEERS) LTD
206 Edward Rd.,
Birmingham, 12



Società Bustese Prodotti Chimici

BUSTO ARSIZIO VIA ARCONATE 11 TELEPHONE 34,460-34,461

SYNTHETIC MOULDING RESINS

Urea Powders
Chierite 414, translucent
Chierite coloured (colours as required)
Chierite densified

Phenolic Powders
Chierolo 1500 with excellent properties
Chierolo 1300 economic grade

BAND & CARTRIDGE HEATERS

for the
PLASTICS INDUSTRY

MICA-WOUND BAND HEATERS MADE FROM BEST QUALITY MATERIALS. SUITABLE FOR EXTRUDERS, DIES, BARRELS AND MOULDING PRESSES. LAGGING CASES ASBESTOS MATTRESS FILLED. OUR ENGINEERS WILL DISCUSS YOUR PROBLEMS ON SITE.

PHONE 52148 **GENRISTO** LTD. OSMASTON ST. NOTTINGHAM

'HARCO'
PERFORATED METAL

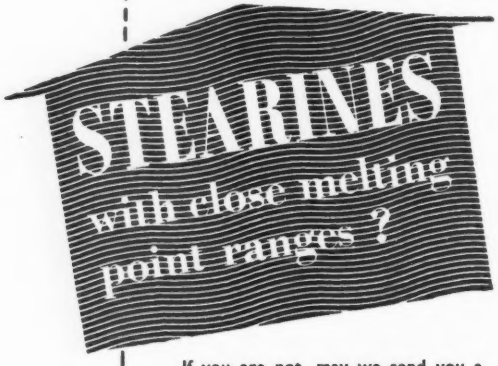
Accurately perforated and extremely durable, ' Harco ' Perforated Metal is produced in most metals for any grading, screening or sorting requirement. A wide range of plain, embossed and ornamental patterns is available.

Send for Catalogue No. PS 926.

Harvey

Telephone: GREenwich 3232 (22 lines)
G. A. HARVEY & CO. (LONDON) LTD., Woolwich Road, London, S.E.7

Are you buying these



If you are not, may we send you a testing sample ? You will then appreciate the true texture and high quality of Haigh's Stearines and will be able to test for yourself the accuracy of their melting points. Let us have details of your production needs and we will be pleased to submit samples and prices.

HAIGH FOR A1 QUALITY

JOHN HAIGH & COMPANY LIMITED
CLAYFIELD OILWORKS . SLAITHWAITE . YORKS
Telephone: SLAITHWAITE 266-267 *ESTABLISHED 70 YEARS*
JH/S6

TOOL MAKERS GAUGE & ASSOCIATION

DESIGN & PRODUCTION CAPACITY AVAILABLE NOW
for small to medium sized
PLASTIC MOULDS

CIC

CHURCHILL INSTRUMENT CO. LTD.
14 WORDSWORTH ROAD
HARROW · MIDDX
TEL: HARROW 7733

STAINLESS STEEL FABRICATIONS

for the PLASTICS, FOOD & CHEMICAL INDUSTRIES

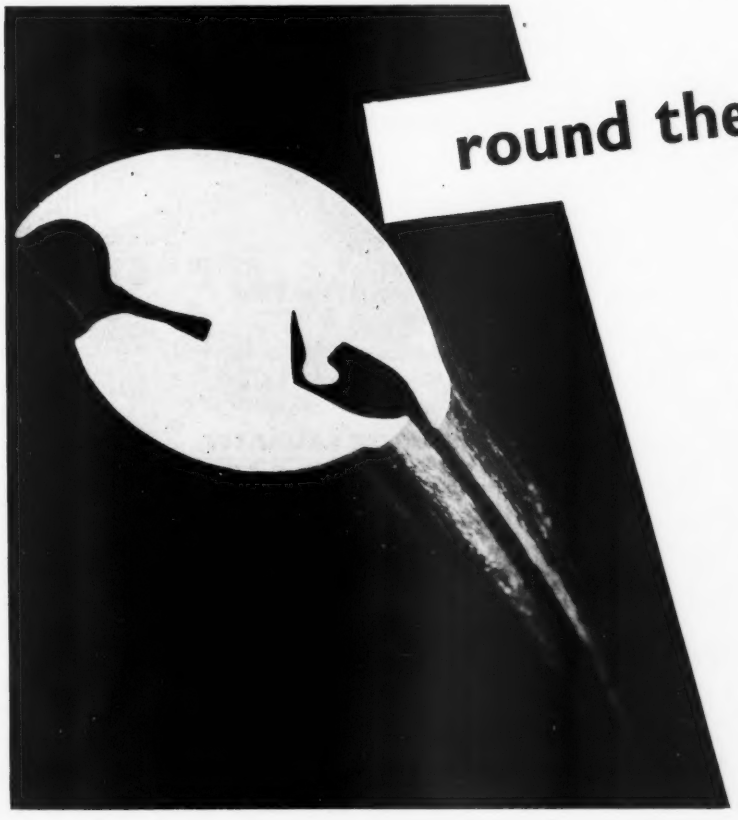
We invite your enquiries for jacketed pans, pressurized or vacuum vessels, mixers, trucks, conveyors and all manner of equipment in stainless or mild steels.

- *We will be happy to design and build special purpose plant and machinery to meet your specific requirements.*

ALL STAINLESS
HELICAL MIXER-CONVEYOR

FREEMAN TAYLOR MACHINES LIMITED

NECTON STREET • SYSTON • LEICESTER *Telephone: Syston 86907 (4 lines) Telegrams: "Dyemac" Leicester*



Don't let plastic extrusion problems get you down. By consulting us you can count on unbiased technical advice, unequalled production resources and ungrudging personal service.

P.V.C.—

- **RIGID & FLEXIBLE**
- **POLYTHENE**
- **ACETATE**
- **POLYSTYRENE**

TUFFLEX

C. & C. MARSHALL LTD.

PLASTRIP HOUSE
OAKLEIGH ROAD NORTH, LONDON, N.20

Telephone: Hillside 5041 (3 lines) Cables: Tufflex, London
Telegrams: Tufflex, Norfinch, London

Stout Cortez gazing on the Pacific has nothing on the man who first experiences G.G.L. service and quality. Trouble is, he tends to go on and on regardless, and when you get carried away, anything can happen. Still, we don't suppose you will blame him if you have ever tried G.G.L. yourself.

CAPSTAN AND AUTOMATIC WORK AND SHEET METAL PRESSINGS IN ANY METAL, ANY FINISH, ANY QUANTITY

FOR QUICK SERVICE AT THE RIGHT PRICE GET IN TOUCH WITH:

GRIFFITHS, GILBART, LLOYD & CO. LTD.

EMPIRE WORKS, PARK ROAD, BIRMINGHAM 18

TEL.: NORthern 6221

G·G·L

Elm Plastics LIMITED

Solely Moulders to the trade, Tool Designers, Toolmakers, Injection Moulders, Slush Moulders, Vinyl Rotation casting and assemblers.

Styrene, Cellulose Acetate, soft, semi-rigid and rigid P.V.C., Alkathene and Diakon.

Nylon.

Elm Plastics Limited

RAINHAM, KENT

'Phone: Rainham, Kent, 81447

JUSTOFLEX E.50
(EPOXIDISED SOYABEAN OIL)

JUSTOFLEX E.60
(EPOXIDISED COTTONSEED OIL)

EPOXIDISED ESTERS

STABILISER/PLASTICISER DISPERSIONS

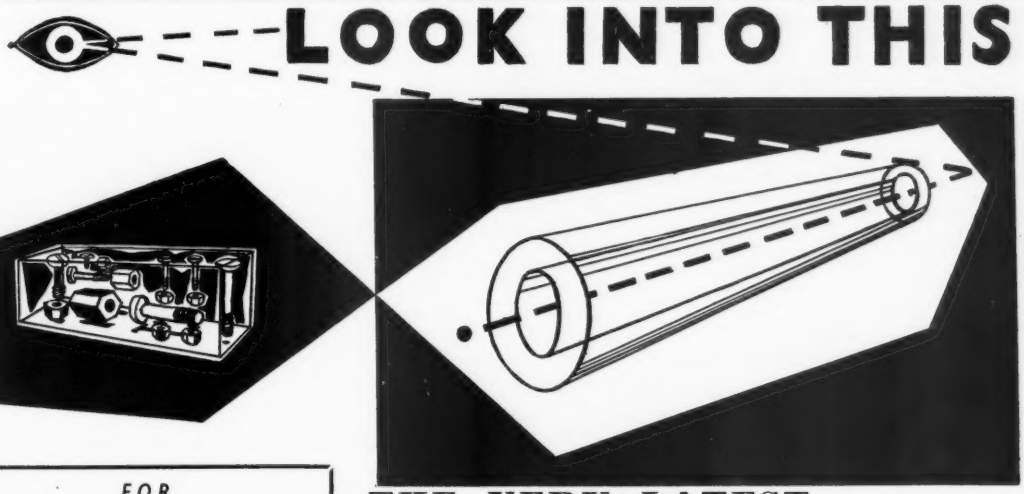
METALLIC LAURATES, RICINOLEATES,& STEARATES

LEAD PHOSPHITE DI-BASIC

ST JUST

THEODORE ST. JUST & COMPANY, LIMITED

WHITEFIELD, MANCHESTER, ENGLAND · Tel.: Whitefield 3211



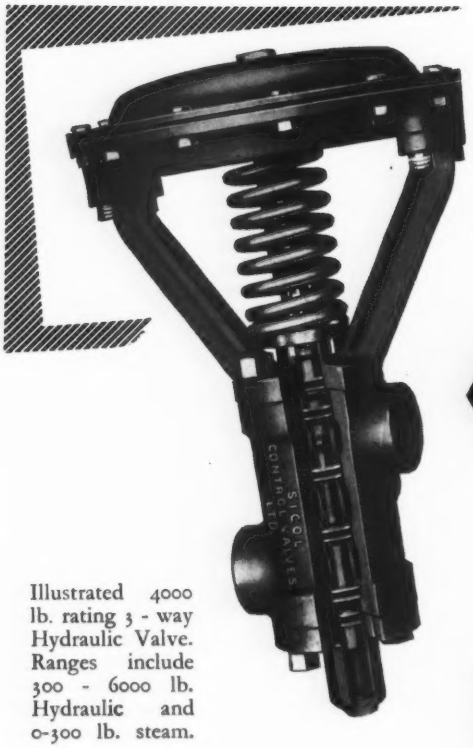
FOR
ADVERTISING DISPLAY

Clear Acrylic embedding dramatises your products in glistening exploded views or compelling arrangements which are protected from dust, grime and tarnish.

THE VERY LATEST development in Acrylic tubing is **thick-walled** "Transpalite" Seamless Cast Cylinders, with wall thickness from $\frac{3}{8}$" to 4" in lengths up to 4 feet with 2" to 18" O.D. Here is a challenge to industry for wider applications for this versatile plastic. How is it going to help you?

We also welcome your enquiries for polished seamless tubes, fibre glass laminations, custom acrylic castings, slab castings to pattern.

STANLEY PLASTICS LTD.
HAMBROOK CHICHESTER SUSSEX



Illustrated 4000 lb. rating 3 - way Hydraulic Valve. Ranges include 300 - 6000 lb. Hydraulic and 0-300 lb. steam.

cut overall cycle time...

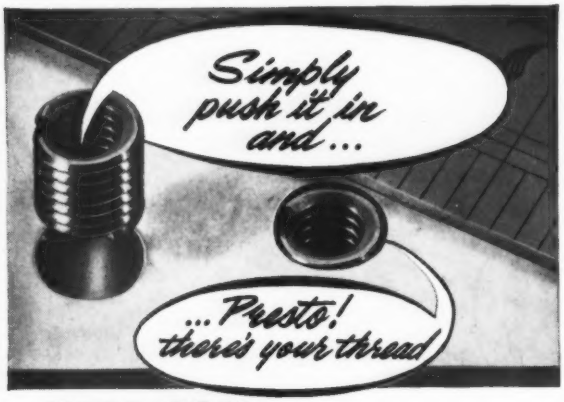
Faster operation, and tight shut off on your Hydraulic and steam services—Sicol valves give you this.

Your presses can save time on each cycle with automatic control. You know what automatic control will do for you. Improve the quality of your product and keep it consistent, divert skilled labour to more profitable uses, reduce overheads AND increase production. Remember, only Hunt & Mitton Sicol valves can give you this!

Write to us for full details of our automatic controls.

HUNT & MITTON LIMITED quality valves

OOZELLS STREET NORTH, BIRMINGHAM, 1 TELEPHONE: MIDLAND 0393



HELI-COIL
REGISTERED TRADE MARK

PUSH-TYPE INSERTS

THE READY-MADE THREAD FOR MOULDED MATERIALS

Eliminate the need for solid bushings and tapping, use HELI-COIL PUSH-TYPE INSERT the ready-made screw thread for moulded and plastic parts, die cast alloys, powdered metals, all soft light materials and many hard metals. Pushed directly in drilled cast, or moulded, blind or through holes, this is the ideal low-cost, volume production, fastening method. A few shillings in tooling is all you need for up to 1,200 holes and more per hour.

For faster, cheaper production

Write for details to:
ARMSTRONG PATENTS CO. LTD., BEVERLEY, YORKS.

BAP9

MOULDING ?

Where it's a question of Moulding the right article at the right price mark thus X and remember the name

XENIT PRODUCTS LTD.,
95 FARNHAM ROAD, SLOUGH
Telephone : **21289**

Compression and Transfer Moulders in Thermosetting Materials

Double your production . . .

. . . WITH THE NEW ECKERT & ZIEGLER EHS/100 2½ OZ. ELECTRO-HYDRAULIC INJECTION MOULDING MACHINE

- ★ Fully automatic, semi-automatic or push-button drive.
- ★ Shot capacity: 2½ oz. (Polystyrene).
- ★ Very high plasticizing capacity of approximately 17 lb. per hour.
- ★ Exceptionally fast opening and closing times.
- ★ Six to eight mouldings per minute, depending on material.
- ★ Size of die-plates: 20 in. × 12 in.

Service and Spare Parts always available.

SOLE AGENTS

ARPAL

ARPAL (ENGINEERS) LTD.,

Abford House, Wilton Road, London, S.W.1. Tel.: VICtoria 0783, 2785, 4880.

SPRITZGUSS

JOSEPH WEIL and Son Ltd

Friars House, 39-41 New Broad St.
London E.C.2 'Phone: Lon 5052 P.B.X

n-BUTYL ALCOHOL

conforming to B.S.S.508:1956

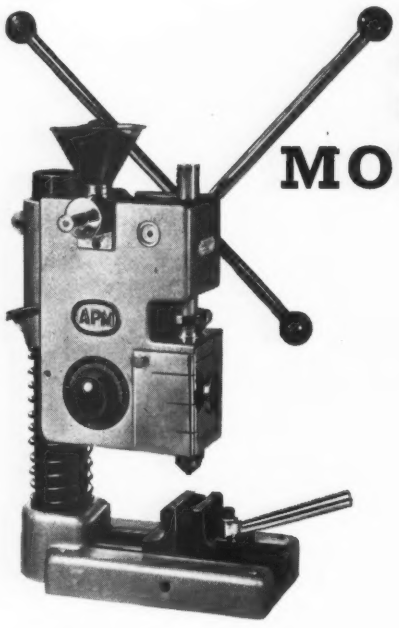
n-BUTYL ACETATE

conforming to B.S.S.551:1956

2-ETHYL HEXANOL

conforming to B.S.S.1835:1952

DELIVERIES AVAILABLE EX BULK STOCKS



APM 21

HAND OPERATED BENCH INJECTION MOULDING MACHINE

★ SUITABLE FOR WORKING THERMOPLASTICS—CELLULOSE ACETATE, POLYSTYRENE, POLYTHENE, P V C, etc., with normal cylinder—NYLON with special cylinder.

★ FITTED WITH SEMI-AUTOMATIC HOPPER FEED.

★ CAPABLE OF PRODUCTION RATES, depending upon mould design UP TO 100 INJECTIONS PER HOUR WITHOUT SPECIAL SKILL.

AND TWO TOTALLY NEW FEATURES!

★ FITTED WITH NEW LEAK-PROOF, SELF-SEALING AND INTERCHANGEABLE CYLINDER UNIT (Patented).

★ CAPABLE OF ACCOMMODATING MOULDS OF VARYING SIZES IN NEW QUICK-ACTING CAMLOCK VICE.

ASMIDAR PLASTIC MOULDING MACHINES LTD.

5 RAMPAYNE STREET, LONDON, S.W.1 Telephone: VICtoria 5555 (3 lines)

PLASTICELL

Patented Constructional Material

FOAMED CELLULAR P.V.C. RIGID OR SUPPLE

Densities 2.5 to 19 lb./cu. ft. High Mechanical Resistance. Gas, Vapour and Liquid Seal.
Remarkably low heat conductivity :: Non-ageing :: Non-inflammable.
Acid resisting :: Non-nutritious.

IDEAL CORE FOR SANDWICHES, ESPECIALLY WITH G.R.P. SKINS

Economic construction especially using direct lay-up process

Full information from

PLASTUDY LTD., 32 VICTORIA STREET, LONDON, S.W.1

ABBey 2733

BUYERS

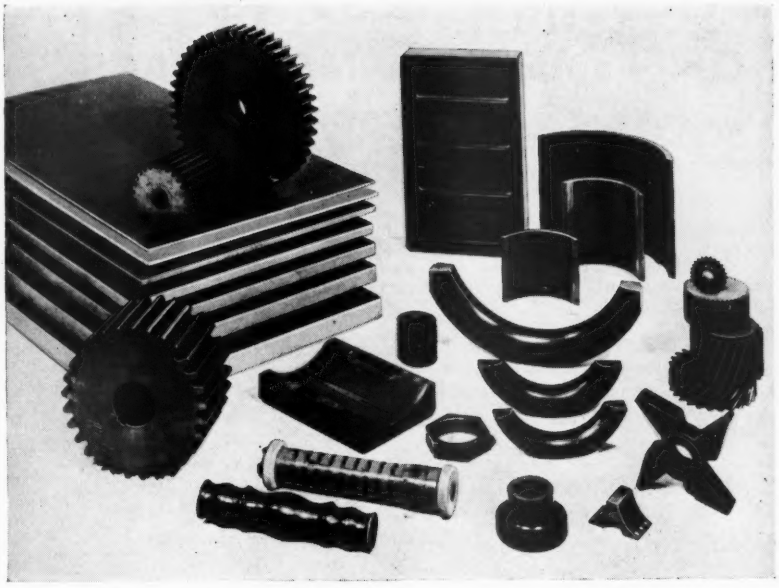
MICHAEL S. STEVENS LTD

Do not let your Scrap Plastics pile up and use up valuable storage space—convert it into money by ringing Michael S. Stevens Ltd. who specialize in Works Collection of Injection Scrap, Scrap cuttings, etc.

MICHAEL S. STEVENS LTD.
Keswick Rd., London, SW15

VANDYKE 3345-6

Formapex plastic laminates



For machined parts — gears, pinions, bearings, thrust washers, collars, valve seatings, etc., or jigs, FORMAPEX combines excellent machining properties with resilience, toughness, and a low coefficient of friction. It is supplied in sheets up to 6" thick, in rods of round and rectangular section, and is highly resistant to moisture, dilute acids and organic liquids.

Paper based quality also available for electrical insulation work.

IOCO LIMITED, Anniesland, Glasgow, W.3
Telephone: Scotstoun 5501-6

"EVOLITE"
Clear Acrylic Seamless Tubes

Standard Range Available Ex Stock in 6ft. lengths. Can also be supplied in lengths limited only by transport facilities. Colours and special sections made to order.

Our Fabricating, Turning, Moulding and Engraving Departments offer a complete service for all your requirements in acrylic.

"PERSPEX", SHEET, BLOCK & ROD available from stock

Sole Manufacturers:
RICHARD DALEMAN LTD.
325/327 LATIMER ROAD, LONDON, W.10
Tel.: LADbroke 3709/1879 A.I.D. Approved

A practical textbook on plastics

THE PROPERTIES AND TESTING OF PLASTICS MATERIALS

By A. E. Lever and J. Rhys

This new book, the first of its kind, is a reference work for those engaged in the testing of plastics and contains comparative technical information, much of it in readily understandable tabulated form, on a wide variety of materials employed in plastics manufacture.

The authors have had considerable experience in plastics, and have here collated in a convenient form all available information on the physical and chemical properties and methods of testing plastics.

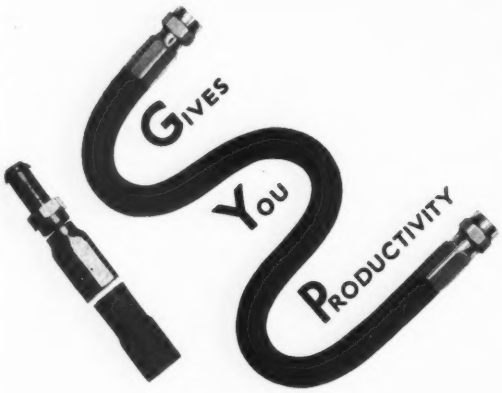
Containing over 1,600 references, a comprehensive glossary of reference abbreviations and an extensive index, this volume will prove invaluable to research workers, development staffs, inventors and students in the plastics and associated industries. At the same time it will serve as a standard work of reference to all who manipulate or use plastics materials, containing as it does complete material specifications.

Royal 8vo. Cloth Boards 30/– net. (By post 31/–)

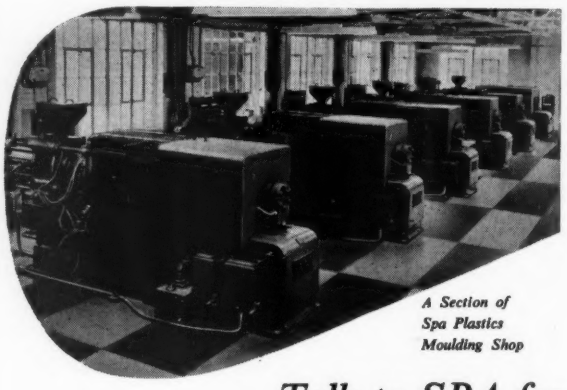
Obtainable from Booksellers or direct from the Publishers

TEMPLE PRESS LIMITED · BOWLING GREEN LANE · LONDON E.C.1

FLEXIBLE HOSE ASSEMBLIES WITH DETACHABLE & RE-USABLE CONNECTORS



HIGH-PRESSURE COMPONENTS LIMITED
'SUNFLEX WORKS' · WEST DRAYTON · MIDDLESEX



A Section of Spa Plastics Moulding Shop

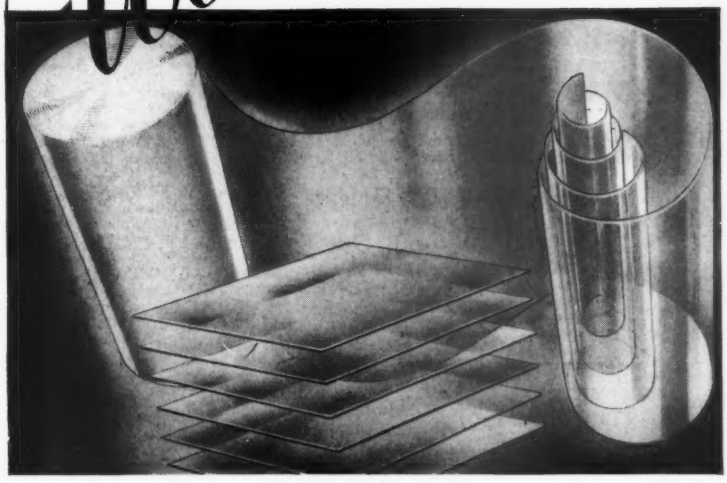
Talk to SPA for Injection Moulding 2 oz. to 32 oz.

- Modern Plant.
- 24 Hour Production.
- Capacity for high quality Injection Mouldings in Nylon, Polythene, Cellulose Acetate, Polystyrene and Diakon.
- Utilise our long experience.

SPA PLASTICS (Division of Spa Brushes Ltd.)
Chesham, Buckinghamshire.
Telephone : Chesham 81200 (4 lines)

Utilex

CELLULOSE ACETATE
sheets and films
SUITABLE FOR VACUUM FORMING



CLEAR TRANSPARENT
pol/pol or matt/pol

COLOURED TRANSPARENT
tinted

LAMPSHADE MATERIAL
matt or embossed

COLOURED OPAQUE
pol/pol or matt/pol

METALLISED
mirror-finished in silver and colours

INSULATING
dielectric qualities

UTILEX LIMITED *MILL STREET, KINGSTON-ON-THAMES. Telephone: KINGSTON 1660*

Are you extruding —

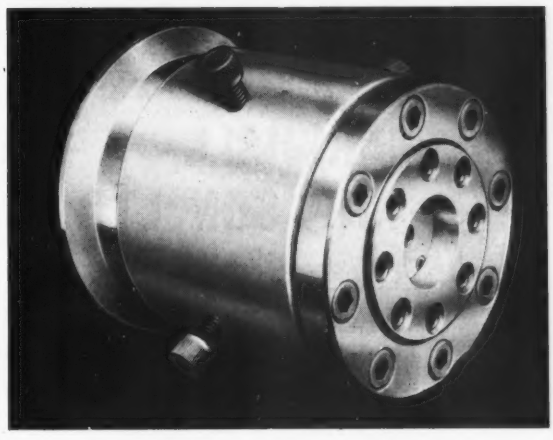
Built to suit any Extruder

YOU ARE?

Then—you can cut costs by using the **"PLASTO" MULTI-DIE HEAD**

(Prov. Pat. No. 14384/57.)

A large " PILOT " allows for use of small dies for small jobs; and provision is made for using Button Dies for short runs. An extra spider houses two mandrels for use with two Tube Dies which float in special attachments to ensure equality of wall thickness.



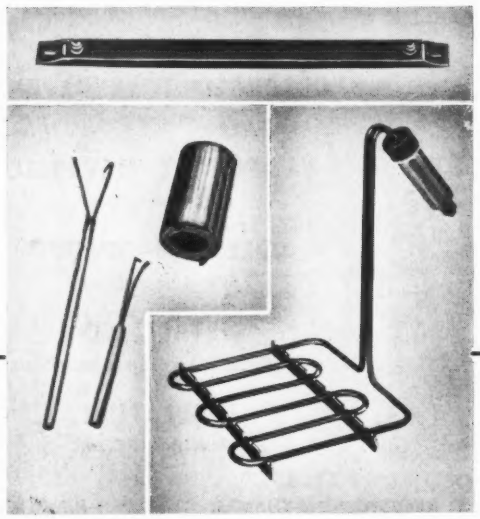
Model PN/10 for 2½" "PECO"

Grams: Jiggentool, Luton, Beds.
Phone: Luton 6029

PIECE-PARTS & ASSEMBLIES
112 MIDLAND ROAD · LUTON · BEDS

elmatic

Specialists in **HEATING FOR PLASTICS**



Manufacturers of

Mica and Ceramic Band Heaters
Ceramic Strip Heaters
Cartridge Heaters
Sheathed Wire Elements
Special Units

elmatic

COLCHESTER FACTORY ESTATE . CARDIFF
Telephone: Cardiff 45335.

When you require

INJECTION MOULDINGS

Contact

PLASTICS DEPARTMENT

C. F. MARSHALL AND SON LTD

HAZELWOOD WORKS
ARTERIAL ROAD
LEIGH-ON-SEA
EASTWOOD 54261

MODERN PLANT CAPACITY
3 to 30 ozs.
ENSURES FIRST CLASS WORK & SERVICE

—MODELS—

We are specialists in Product Design and Model making for the Plastics Industry. In this now accepted technique for conveying ideas from the 'Seed,' through Design and Sales 'Approval' to the Mould-Maker, our Models have proved invaluable at every stage—with our Design Capacity offering supporting facilities.

CONSULT US ON YOUR NEXT PROPOSED PROJECT

R. J. EMERY & Co.
WELWYN GARDEN CITY
***Telephone:* Welwyn Garden 4720**

MILLETT. LEVENS (ENGRAVERS) LTD.

NAMEPLATES
DIALS, SCALES
CALCULATORS
SIGNS, DISPLAYS
TAGS, LABELS
TICKETS
DISCS, CHECKS

ELSTREE 2871
(10 lines)
FOR ALL PRINTING & ENGRAVING ON
CELLULOID
BAKELITE
ACETATE
PERSPEX
AND ALL OTHER MATERIALS

ADVERTISING NOVELTIES
RULERS
DRAWING SETS
BOOKMARKERS
CALENDARS
RADIO SCALES
INDICATOR TABS

STIRLING CORNER, BARNET BY-PASS
BOREHAM WOOD · HERTS

THOMAS DE LA RUE AND CO. LTD.

YEAR OF PROGRESS AND CONSOLIDATION

MR. B. C. WESTALL ON TWO EVENTS OF MAJOR IMPORTANCE

The 60th annual general meeting of Thomas De La Rue and Company Limited was held on July 24 in London.

Mr. B. C. Westall, C.B.E., M.A. (the Chairman) presided and, in the course of his speech, said:

The profit, before taxation, has risen from £911,645 to £1,181,878. This is the first time in the Company's history that a profit has exceeded £1-million and I think we might view this as a landmark in our business. Tax, of course, rises sharply from £592,342 to £677,666. Dividends will absorb £196,420 as against £169,798 on the assumption that Stockholders will not object to the raising of the Final Dividend from 20% to 25%, making 35% for the year. This leaves us with a surplus of £307,792 which we propose to add to the carry forward. The General Reserve is already at the substantial figure of £1,300,000.

After commenting on the items in the Balance Sheet, the Chairman said: The aggregate commitments for capital expenditure not provided for is £515,000, largely for the Australian factory. This, however, is not the end of the story. On the Security side we have, since the close of the Balance Sheet, acquired a factory in Brazil, where we have formed a new Company. We are also building new machinery for banknote printing. On the Plastics side we are erecting new buildings in Tynemouth for the expansion of our laminated products, FORMICA and DELARON. We shall have to make provision, too, for the expansion of the French Company which, since the close of the Financial year, has become a Subsidiary by our acquiring a majority shareholding.

Even so, it would seem to me that for the next twelve months we are likely to have sufficient funds to meet capital requirements as they become due for not all the sums I have mentioned will be payable in the Current Year. On the other hand, our businesses, both in the Security and Plastics Divisions, are expanding so rapidly that I cannot rule out the possibility that further developments may take place before we meet again which might have to be financed by a Capital Issue.

Important Developments

This year that has passed has been one of progress and consolidation. Our turnover has reached new records and we have made our record profit in spite of the fact that, in common with many other companies, we undertook price maintenance for the past year. The rise in costs has been met partly by greater efficiency in the factories and partly by expanding turnover. Also, two events of major importance have occurred. One is the placing of a contract for machines for the printing of the U.S. Currency by the United States Treasury, and the other is the conclusion of an agreement between the American Cyanamid Company and ourselves on the development of FORMICA.

Apart from the value of the contract itself, it is, I think, the greatest compliment that could be paid to Thomas De La Rue and Co. Ltd., that the Bank of England and the United States Treasury should have selected the De La Rue machines for the printing of the pound and the dollar. After referring to other developments in the Security Division, the Chairman reviewed developments on the Plastic side of the business and, commenting on the agreement with the American Cyanamid Company, said:

An important item in the agreement is the provision for a period of 25 years for full and complete exchange of technical information in the field of laminated plastics. Knowing something of the huge sums which American Cyanamid Company spend annually on Research and Development I feel certain that this feature of the arrangement will be of very material value in the years to come. We also attach considerable importance to the fact that our export markets, particularly in the Far Eastern Area, have been greatly expanded and both for American Cyanamid and ourselves the fact that we are marketing plastic products throughout the world under the common trademark FORMICA on a permanent basis will give immense advantages over our competitors.

Other Activities

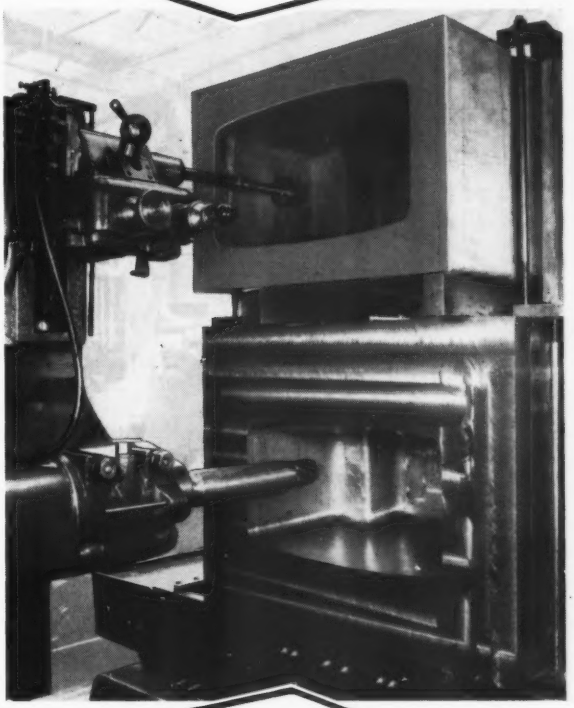
In the Potterton Division there has been some small improvement on previous results and there is no doubt this would have been wholly satisfactory if the Suez crisis had not coincided with the launching of the full range of our new oil-fired boilers. In addition to this new undertaking of ours in oil burning we have produced a number of new gas-fired boilers which have had a very favourable reception by the Gas Industry and the public in general and I believe that this side of our activities will show further improvement this year.

There has been no improvement in the results of the Stationers Division in spite of strenuous efforts to make headway after a prolonged period of disappointments. However, I hope to be able to report better news about this old section of the Company's activities when we meet this time next year.

Next year I again hope to be able to record another year of progress and expansion. Continued progress will depend on whether free enterprise is going to be allowed to develop freely. We in De La Rues believe that success can only be achieved by boldness in launching new products, in the building of factories at home and abroad, and the untiring search for new markets. We do not want the freezing of dividends. We have already proved that by the excellent co-operation between the Management and the employees greater efficiency can be achieved and the big increase in our turnover bears this witness.

The report was adopted.

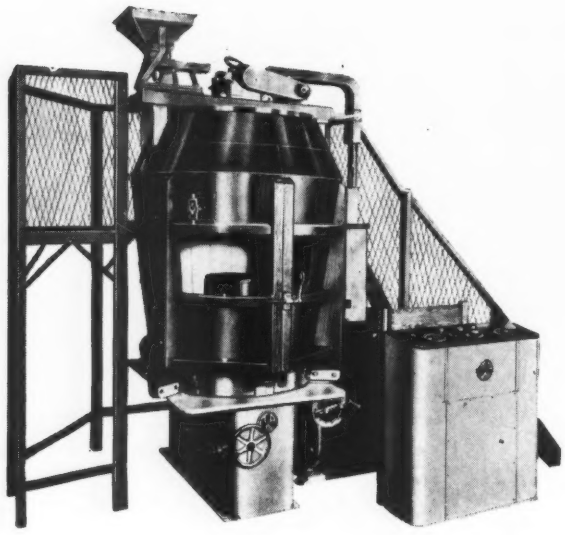
Pioneers



IN
MOULDS
FOR MODERN PLASTICS
ALSO . . .
JIGS AND GAUGES

GAUGE & TOOL MAKERS ASSOCIATION

BARBER & DUFFY LTD
214/222 CARDIGAN ROAD, LEEDS
'PHONE : LEEDS 52033



From endless glass fibre roving to a finished preform by the

T.A. PREFORM MACHINE

An essential installation for the mass production of glass fibre reinforced plastic mouldings.

Accurate control of materials.
Uniformity of production.
Adaptability.
Unskilled operation.
Fast production cycle.

Manufactured in three sizes:
Standard model 28 inch.
Larger models 48 and 72 inch.

For further particulars apply to the makers.

TURNER ATHERTON & Co. LTD. DENTON, MANCHESTER. *Phone: DENton 2275/6*

CHIEF INDUSTRIAL CHEMIST

required by a large electronic engineering company in Essex to take charge of modern works laboratory and staff of twelve. Responsibilities include metallurgical (ferrous and non-ferrous) and chemical analysis, technical control and development of painting and plating processes, investigation and development of new techniques, e.g. resin encapsulation.

Applicant should be a qualified chemist or metallurgist and have had previous industrial experience. Age 30–40 preferred. Assistance given with housing.

Applications, which will be treated as confidential, should include full details of qualifications and experience, to Box P187, LPE, Romano House, 399/401 Strand, London, WC.2.

METALIZATION

Capacity available for all types of plastic metalization

- **KEEN PRICES**
- **PROMPT DELIVERY**
- **EXPERT WORKMANSHIP**

Worthing Metalization Co.
31d Station Road, Worthing, Sussex, England

TRADE EMPIRITE MARK

Empire Plastics (Birmingham) Ltd

EMPIRE WORKS
BRUETON STREET
BIRMINGHAM · 4
Phone: ASTon Cross 2451

PLASTIC MOULDINGS FOR THE TRADE

MILTOID SALES DIVISION

BX PLASTICS LTD.
A Subsidiary of the British Xylonite Co., Ltd.,

FOR

CELLULOID

BEXOID REGD.
CELLULOSE ACETATE

BEXOID OPTICAL SHEET

BEXOID FILM

BX POLYSTYRENE

COBEX REGD.
RIGID VINYL SHEET

VELBEX REGD.
FLEXIBLE VINYL

In clear transparent and industrial black sheet,
Velbex P.V.C. transparent beverage hose
and industrial hose

LAMPSHADE SHEET
IN BEXOID AND COBEX

AKULON (Nylon) RODS
Sole Distributors for the British Isles

34/36 ROYAL COLLEGE STREET · LONDON, N.W.1
PHONE EUSTON 4146/7 GRAMS: CELUDOL, NORWEST LONDON

T.A.10334

SHAWINIGAN

POLYVINYLBUTYRAL

'BUTVAR'

in 5 grades for

★ TEXTILE FINISHES
★ FOIL COATINGS
★ METAL BONDINGS
★ CAN LININGS
★ WASH PRIMERS

from

SHAWINIGAN, LIMITED

MARLOW HOUSE, LLOYD'S AVENUE,
Telephone: ROYal 6102/4 **LONDON, E.C.3** Telegrams: IGANSHAWIN FEN, LONDON

All our products are backed by Technical Service

Maximar MOULDINGS·LTD

Codmore Hill, Pulborough, Sussex

SPECIALISTS IN THE MAKING OF GLASS-REINFORCED POLY-ESTER RESIN MOULDINGS BY THE HAND LAY-UP METHOD

Used for boats, vehicle bodies, chemical tanks, ventilation ducts and innumerable other articles having double curvature and hence impossible to make from sheet material, the method is very economical in tool costs. Mouldings can be made directly on sheet metal moulds or from glass/resin moulds taken from wood or plaster formers. Light weight and high strength are allied to durability and completely non-corrosive properties. Colour impregnation means no finishing costs.

Our technical resources are at your disposal.

Write or Telephone Pulborough 393

for high speed mixing and blending

trough-type mixers are unsurpassed in performance particularly when equipped with the good features of Pascall powder mixers. These mixers are fitted with specially designed spiral mixing blades which produce a rapid blend of the materials.

The contra-flow action of the mixing blades not only ensures a perfect blend of the mixing, but also allows automatic discharge of the mixing when completed. The blades are also removable, a feature that facilitates cleaning the mixers.

Available in six sizes with trough-mixing capacities from 2 to 20 cu. ft., either fabricated from mild steel or stainless steel and also from mild steel with non-contaminating linings.

PASCALL

Write or telephone Crawley 25166 for List MX 3908.

THE PASCALL ENGINEERING CO LTD
GATWICK ROAD · CRAWLEY · SUSSEX

Wanted STOCKS for CASH

We are cash buyers of merchandise of every description. Also Clearance Stocks, Discontinued Lines, Surplus and Redundant Stocks. BOTTLES, Jars, Screw Caps, Cartons, and other Packaging Materials. In fact, goods of all kinds can be disposed of through us without delay, on the most favourable terms, and without trouble.

Should you have anything for disposal either now or at any future time please send us samples, full particulars and price on a cash settlement basis and the matter will have our immediate and careful attention.

RELIANCE TRADING CO.

75, FAIRFAX ROAD, SWISS COTTAGE, LONDON, N.W.6
Phone: KILburn 0581 & 0038 *Grams:* "GORDON" KILBURN 0581

CELLULOSE ACETATE PLASTICS

By Vivian Stannett

This is the first book to be devoted entirely to cellulose acetate plastics and has been written in such a way as to appeal to the general reader, the businessman and the technician. A chapter on packaging and container applications is included.

"An excellent contribution to the plastics literature."
CHEMICAL AND ENGINEERING NEWS

Demy 8vo. Illustrated

30s. net. from all Booksellers, or by post from the Publishers (postage 1s. 2d.).

TEMPLE PRESS LIMITED
BOWLING GREEN LANE · LONDON E C 1

M.C.M.

(TOOLS) LTD.

Designers and Toolmakers
for Compression, Transfer and Injection Moulds, Pressure Die Casting Tools, Jigs and Fixtures

Let us solve your difficulties

M.C.M. (Tools) LTD. 715 Kings Road, Kingstanding
BIRMINGHAM, 22C. *Great Barr 1112/3*

INJECTION MOULDINGS
UP TO 12 OZS. CAPACITY IN
• DIAKON • POLYTHENE
• POLYSTYRENE • NYLON and P.V.C.

- VACUUM PLATING and SPRAYING
- 3-D MOULDINGS and NAME PLATES
- MACHINED PARTS IN PLASTICS and METALS
- PLASTIC COVERING
- WE OFFER OUR 30 YEARS' EXPERIENCE TO YOUR NEEDS

Contractors to H.M. Government

Ketch PLASTICS LICHFIELD

Telephone: LICHFIELD 3591–2

Have you a TUBE PROBLEM?

—if so, let us solve it

As a user of tubes—metal or otherwise—just consider whether or not a PAPER tube will do the job. Our paper tubes, **made of special quality paper, are impregnated with Thermo-hardening resins.** Strong, light in weight, they show a definite economy in cost. Used increasingly with every satisfaction in many industries. It will pay you to investigate this. Write to:

THE TEXTILE PAPER TUBE CO. LIMITED

OAKWOOD MILLS · ROMILEY · NR. STOCKPORT

Telephone: Woodley 2271-4

FlexiGrip

plastic slide fastener

Covered by Patents and Registered Designs throughout the world

The ideal fastener for plastic brief cases, cosmetic and toilet bags, tobacco pouches, garment bags, etc.

Dustproof and moisture-proof. Can be welded or sewn.

Best for plastic . . . Because it is plastic.

All Enquiries to :—

FLEXIGRIP LIMITED

Sole Licencees and Suppliers for the United Kingdom

EFFINGHAM HOUSE, 1 ARUNDEL ST., LONDON, W.C.2

COVENT GARDEN 0353

PLASTIC SCRAP

ALL GRADES
OF THERMOPLASTIC MATERIALS WANTED

Warehouses: 7a West End Lane, N.W.6, *Maida Vale 6905 and* 83a Cable Street, E.1, *Royal 3349*

DAVIS PLASTICS LIMITED *Head Office:* 17-20 ALL SAINTS ROAD, LONDON, W.11. *Park 9874/5*

PHOSPHORESCENT (Luminous) and FLUORESCENT PIGMENTS

DERBY LUMINESCENTS LIMITED
107, OLD BROAD STREET, LONDON, E.C.2
TEL: MINCING LANE 5272

WORKS:
MILLMARSH LANE BRIMSDOWN
ENFIELD MIDDLESEX
TEL: HOWARD 2208

BYSON FOR BAKELITE

Acetate and other Synthetic Mouldings, Modern Plant and Facilities.

APPLIANCE CO. LTD.,
WOOLFOLD, BURY, LANCS
Telephone: Bury 1560–1 Telegrams: "Bysonite, Bury"

PLASTICS

POLYTHENE, Polystyrene, Acetate and Perspex. We are sellers and buyers of these materials in any form.
GRANULATION and reprocessing plant available for:— Nylon, Cellulose Acetate, Polystyrene, Polythene and other Thermoplastic scrap. Materials ground to customers' requirements.

All enquiries to:—

John Castle & Co. Ltd.

5 HURLEY RD., LONDON, S.E.11
Phone: RELiance 4274/5

CUT YOUR TRIMMING COSTS
BY USING
DEFLASHING TOOLS
INSIDE AND OUTSIDE FORMS
IN ONE OPERATION

HERBERT DALES & PARTNERS
NEW CUBBINGTON : LEAMINGTON SPA
Phone: LEAM 2769

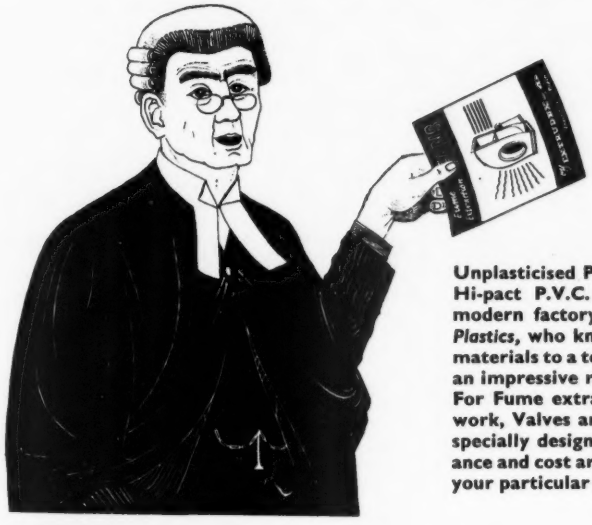
ACRYLIC SEAMLESS TUBES
CAST & EXTRUDED (2" to 6" O.D.) ($\frac{1}{4}$" to $1\frac{3}{4}$" O.D.)
ALSO
MOULDED FABRICATIONS IN **"PERSPEX"**

AIRCRAFT VISION PANELS TO A.I.D. SPECIFICATIONS
LIGHTING FITTINGS (REFLECTORS & DIFFUSERS)
SCOOTER WINDSCREENS . CARAVAN PANELS AND WASHBASINS . INDUSTRIAL APPLICATIONS, ETC.

All Productions to a High Standard of Quality by Specialists.

SUNTEX SAFETY GLASS IND. LTD., IVER, BUCKS
TEL.: UXBRIDGE 4970; IVER 11/12
and
MOON AIRCRAFT LTD., BOX, WILTS
TEL.: BOX 488

A Complete Fabrication, Mi Lord!



The case for EXTRUDEX is a straightforward one. For complete fabrications in Unplasticised P.V.C., Polythene, and glass/fibre laminates, EXTRUDEX research, skill and ingenuity are without equal. A comprehensive production of extruded tube up to 15″ dia. in Unplasticised P.V.C. and Polythene, and up to 8″ dia. in Hi-pact P.V.C. and Ziegler Polythene. Here are a modern factory and a team of experts who *think in Plastics*, who know the virtues and limitations of their materials to a tee, and whose achievements to date make an impressive record.
For Fume extraction systems and Fans, Ducting, Pipework, Valves and Storage tanks, as well as many other specially designed installations, where corrosion resistance and cost are vital considerations, the best answer to your particular problem may well be at EXTRUDEX.

EXTRUDEX *Creative Engineers in Plastics*

SEND US YOUR ENQUIRIES ABOUT: PLASTICS TUBING · FUME DUCT SYSTEMS · FANS · VALVES · TANKS · TANK LININGS · SCRUBBING TOWERS · etc.

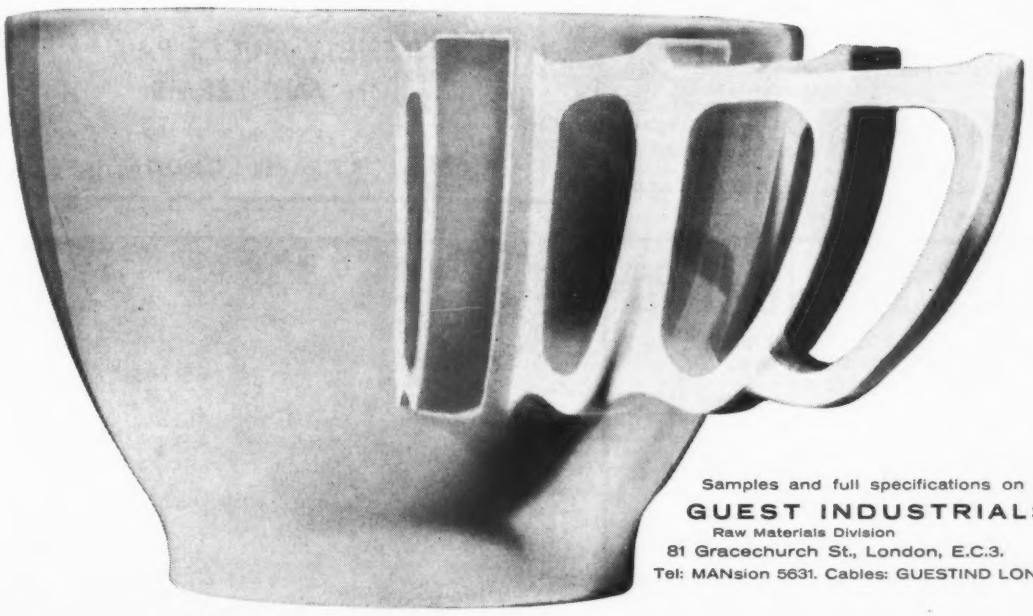
EXTRUDEX LTD Western Road · Bracknell · Berks *Tel.: Bracknell* 1000

Mepal Melamine Moulding Compound

A plastic moulding compound with exceptional qualities. Super china finish in a wide range of rich, fast colours. High tensile strength.

Made by FOSFATBOLAGET, STOCKHOLM 5

STOCKHOLMS SUPERFOSFAT FABRIKS AB



Samples and full specifications on request to

GUEST INDUSTRIALS LTD

Raw Materials Division

81 Gracechurch St., London, E.C.3.

Tel: MANsion 5631. Cables: GUESTIND LONDON

We Buy and Sell all types of

PLASTIC SCRAP

We welcome enquiries to grind customers' own material

Acetate
Butyrate
Nylon
Polyethylene

J. W. NASH & CO., LTD.

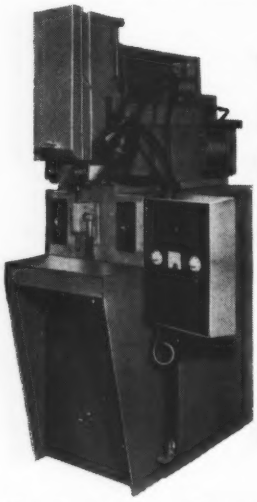
27 BEETHOVEN STREET, LONDON, W.10

Telegrams: NASPEX, NOTTARCH, LONDON
Telephone: LADBROKE 4655-6-7

Acrylics
Celluloid
Polystyrene
P.V.C.

T.I.M.

THERMOPLASTIC INSERT MOULDER
VERSATILE, HORIZONTAL PLATENS, INJECTION MOULDING MACHINE



Tool Costs Negligible
Insert Moulding Easy
Makes Nylon Work Simple
Assembly Faster
Time between design and product reduced
Invaluable for pilot productions
Colour change rapid

Manufactured by:—**Timatic Machines Ltd.**
NODIS WORKS, JULIEN ROAD, EALING, W.5 Tel.: EALing 1864

Marketed by:— **B.L.C. (Exports) Ltd.**
92, BAYLIS ROAD, LONDON, S.E.1
Tel.: WATerloo 3616

CAN YOU USE...

...a complete dispersion to your own specification, containing WHITE LEAD STABILISER, LUBRICANT, FILLER & COLOURING MATTER?

Consult
THE MERSEY WHITE LEAD CO. LTD.
Sankey Bridges, Warrington
Telephone:
Warrington 30258/9

BUYERS OF ALL PLASTIC SCRAP

HERBERT CONNOR LTD

POLYTHENE, POLYSTYRENE, ACETATE PERSPEX, DIAKON, P.V.C., NYLON, IN LUMP, GROUND, FILM, AND SCRAP FORM

HIGHEST PRICES PAID ON ANY TERMS

Please send details and samples to:—

120, BEAUFORT PARK, LONDON, N.W.11

ROLL GRINDING

CALENDER AND RUBBER MILL ROLLS, COTTON, RUBBER COVERED, GRANITE AND OTHER TYPES

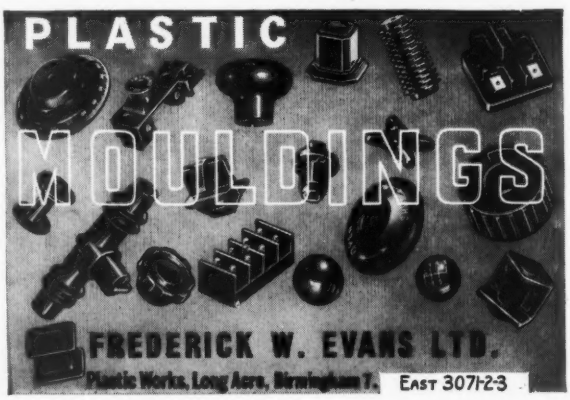
UP TO 200-INCH IN LENGTH ACCEPTED.

HODSON & COMPANY
(MACHINERY) LTD.

SPRING MILLS, TOTTINGTON, Nr. BURY LANCS.

TELE.: TOTTINGTON 123 4

PLASTIC MOULDINGS



FREDERICK W. EVANS LTD.
Plastic Works, Long Acre, Birmingham 7. EAST 3071-2-3

Plastics Classified Advertisements

PRESS DAY.—Classified advertisements for the September issue must be received at Head Office by first post Monday, August 26.

Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—6d. per word (minimum 12 words 6/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 2 gns. per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. Box numbers must not be used for the purpose of circularizing and the proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM.—Facilities are available to readers to purchase advertised goods on approval by depositing the purchase price with "Plastics." Full details on application. Commission 1% (minimum 2/-) on amount deposited.

HEAD OFFICES.—Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, London Telex," Telex: 2-3039.

BRANCH OFFICES: Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Deansgate 6114-8. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

AGENCIES

SOUTH AFRICA. Rhodesias. Technical Sales Representation plastics, raw materials, finished goods, machinery. Lewis, P.O. Box 27, Seapoint, Cape. 240-x9722

AUCTIONS

ESTABLISHED 1855.
EDWARD RUSHTON, SON AND KENYON,
INDUSTRIAL VALUERS, AUCTIONEERS AND
FIRE LOSS ASSESSORS.
12 YORK STREET,
MANCHESTER, 2.
Phone, Central 1937–8.
Grams, Russonken, Manchester. zzz-0304

BUSINESS OFFICES AND PREMISES

LETCHWORTH. Attractive Modern single-floor Factory (lofty), and 2 floor offices. 4,000 sq. ft. plus land for extension. Convenient loading. Immediate possession. Rent £1,250 p.a. excl., on lease, or for Sale. Chamberlain & Willows, 23, Moorgate, E.C.2. (MET. 8001). 239-7

WANTED TO PURCHASE.

THE MARLEY TILE COMPANY, LIMITED,

IS INTERESTED IN PURCHASING

A BUSINESS WITH GOOD MANUFACTURING

FACILITIES OF PLASTICS PRODUCTS.

MUST HAVE POSSIBILITIES FOR EXPANSION.

COMMUNICATE IN CONFIDENCE TO:—

THE MANAGING DIRECTOR,

THE MARLEY TILE COMPANY, LIMITED,

RIVERHEAD,

SEVENOAKS, KENT.

239-5324

BUSINESS OPPORTUNITIES

PLASTIC TOY MANUFACTURERS. As part of an estate, this bank holds U.S. patents to a toy vehicle and launching device therefor. Will sell or license. Direct inquiries to The Harter Bank and Trust Company, Trust Department, Canton, Ohio, U.S.A. 244-5465

POLYTHENE BAGS WANTED. Overseas manufacturer commencing production in the United Kingdom requires Polythene Bags for packing finished products, initial requirement £25,000 per annum wishes to contact two or three layflat film convertors with a view to arranging permanent contracts. Smaller manufacturers giving personal service preferred. Box P391, care of "Plastics." 240-5469

Business Oppoturnities (contd.)

PLASTIC COMPANY engaged in Plastic Moulding required by large organization to form a new Plastics Division. Preferably within 20 miles of Manchester. Information should show the Sales, Production Capacity and Potential Development. Box P3918, care of "Plastics." 239-41

ADVERTISER with own business (not Plastics) requires advice from anyone with sound knowledge of Plastics, particularly welding p.v.c. Any proposition considered. Partnership, or as technical adviser, etc. Box P3922, care of "Plastics." 240-x9905

OLD ESTABLISHED GROUP of Chemical Manufacturers with world wide reputation for existing products, fully equipped for the development and production of pharmaceutical and industrial chemicals, has surplus capacity, and would welcome suggestions for increasing its range. Box P3921, care of "Plastics." 239-46

CONSULTANTS

W. BRUCE BROWN, F.R.S.A., M.S.I.A., designer specializing in the development of new plastic articles. 140, Roding Rd., Loughton, Essex. Tel. Loughton 4138. 241-5467

DESIGN AND DRAWING

DESIGN AND DRAUGHTING SERVICES. We specialize in particular, in Moulds for Plastics, Compression, Transfer and Injection, also jigs and fixtures. We offer a reliable, speedy and confidential service. Spotona Ltd., Watchett Works, Oakhurst Rd., Southend-on-Sea, Essex. 222-115

PLASTICS MOULD DESIGN: Injection, Compression, Transfer. Competitive charges and deliveries. Product design and styling. Also Jigs, Tools, Fixtures, etc. D. & H. Designs Ltd., 265, Finchley Rd., London, N.W.3. HAMpstead 6656. zzz-136

MACHINERY, TOOLS AND PLANT

FOR SALE.—Two Grauel two-colour printing machines bench type. Further details from Ashdowns Limited, Eccleston Works, St. Helens. 239-10

FOR SALE.—One Daniels 200-ton Hydraulic Press. 5½" dia. Pillars at 36" × 16" centres. 16" downstroke ram × 12" stroke. Distance between platens 36" maximum. Fitted with Daniels 50-ton upstroking injection unit. A similar press without injection unit is also available. Mycalex and T.I.M. Ltd., Cirencester, Glos. 239-17

NEW HIGH SPEED 12" ELECTRIC BANDSAWS for sale. For cutting Polythene, P.V.C., Rubber, Perspex, Cork, Leather, Cloth, etc., with 8 speeds. 400/440/3 phase supply. Illustrations and prices from makers F. J. Edwards Ltd., 359 Euston Rd., London, N.W.1. Euston 4681. 239-18

NEW HAND TOGGLE PRESSES for sale. Model PER/1 for bench mounting. Suitable for moulding (with suitable tools), punching, pressing, embossing and riveting work. Dowells at stroke bottom. Pressure exerted 880 lbs. to 1,320 lbs. Centre to back 4½". Table 7" × 7". Max. distance between table and ram 6½". Photo and full details from F. J. Edwards Limited, 359 Euston Rd., London, N.W.1, or 41 Water Street, Birmingham, 3. 239-19

One only. 7-gallon 3-throw Bradley & Turton Pump complete with Motor, starter and guards.
Two only. 100-ton Bradley & Turton Upstroking Presses with gas platens.
One only. 25-ton Vertical Injection Press complete with push backs and guards.
Two only. 15-ton Vertical Injection presses with push back rams.
One only. 15-ton Thompson Upstroking Compression Press with gas platens.
One only. 10-ton Bradley & Turton Upstroking Compression Press with gas platens.
Two only. Gas Pre-heaters.
Box P.394, care of "Plastics." 239-25

Machinery, Tools and Plant (contd.)

HYDRAULIC. Frazer mono-radial pumps, new and secondhand, in stock. Thompson & Son (Millwall), Ltd., Cuba Street, London, E.14. East 1844. zzz-119

RECONDITIONED MIXERS for ALL PURPOSES: Cake Mixers from 10-80-quart capacity, and Dough Kneaders from ½ to 1½-sack capacity. Each machine carefully overhauled and guaranteed—let us send you details. Sorensen Bakery Equipment Limited, 42, Raby St., Moss Side, Manchester, 16. Phone, Moss Side 2054/4054. Grams, Rahbek. 240-5438

SAVE POUNDS!!! Dust, fume Extracting-blowing Fan Units at fraction normal prices. Call for demonstration. Numerous additional items available. Bellangers, 306 Holloway Rd., London, N.7. North 4117. 239-5436

4,000-ton Upstroke Press by John Shaw. Ram. 41 in. diam. × 21 in. stroke. W.P. 3 tons sq. in., 4 screwed columns 16¼ in. diam. with distances 60 in. × 23¾ in. Daylight table and press head 24 in. Operated by 4-column Intensifier and 70 h.p. Hele-Shaw Variable delivery Hydr. Pump. Motorized 400/3/50.

Five 1,160-ton Upstroke Presses by Robertson & Orcher. Glanded ram 33½ in. diam. × 15 in. stroke. Four columns 8 in. diam., distance between 7 ft. 1 in. × 17 in. Semi-guided moving table and head with working area 6 ft. 5 in. × 4 ft. Daylight 13½ in. W.P. 3,000 lb. sq. in. Fitted 2 C.I. Platens 6 ft. 5 in. × 4 ft. × 4½ in.

Two 550-ton Upstroke Presses by John Shaw. Ram 17½ in. diam × 4 ft. 6 in. stroke. Four 7 in. diam. columns distances 72½ in. × 20 in. Fully guided moving table, working space 72 in. × 44 in. Daylight adjustable up to 78 in. W.P. 2½ ton. sq. in. Presses could be adapted as Downstroking unit.

Six 400-ton Upstroke Presses by Greenwood & Batley. Glanded Ram 16 in. diam × 30 in. stroke. Four steel columns 5½ in. diam., distances between 22 in × 17½ in. Fully guided moving table, working area 31½ in. × 22 in. Daylight 42 in. W.P. 2 ton sq. in.

Three 400-ton Upstroke Presses by Greenwood & Batley. Glanded ram 16 in. diam. × 30 in. stroke. Four screwed columns 5½ in. diam., distances between 22 in. × 17½ in. Moving table, working area 3 ft. × 17 in. Daylight 42 in. W.P. 2 ton sq. in.

350-ton Upstroke Press by Bradley & Turton. Ram 15½ in. diam. × 24 in. stroke. W.P. 2 ton sq. in. Four steel columns 4½ in. diam., distances between 42½ in. × 15½ in. Fully guided moving table, working area 39½ in. × 37 in. Daylight 33 in. Moving table returned by 2 pushback rams 4 in. diam. W.P. 1,500 lb. sq. in.

250-ton Upstroke Press. Ram 18 in. diam. × 15 in. stroke. W.P. 1 ton sq. in. Four columns 5⅛ in. diam., distance between 22½ in. × 18 in. Semi-guided tee-slotted table 30 in. × 14 in. × 9½ in. deep., daylight 14½ in.

200-ton Downstroke Press by John Shaw. Ram 20 in. diam. × 24 in. stroke. W.P. 1,500 lb. sq. in. Four columns 4¾ in. diam., distances between 26½ in., 10½ in. Fully-guided moving table, working area 26 in sq.

200-ton Downstroke Compression and for Transfer Moulding Press. Double-acting piston type main ram with effective area 11 in. diam. × 12 in. stroke. Fixed and moving tables with working area 30 in. × 21 in. Daylight 36 in. Double-acting piston type ram 6½ in. diam. × 8 in. stroke. Fitted hydraulically op. Ejector Crosshead.

GEORGE COHEN, SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Phone, Shepherds Bush 2070
AND
STANNINGLEY, NR. LEEDS.
Phone, Pudsey 2241. 240-5475

NEW HIGH SPEED 12 in. ELECTRIC BANDSAWS for sale. For cutting polythene, p.v.c. rubber, perspex, cork, leather, cloth, etc., with 8 speeds. 400/440/3 phase supply. Illustrations and prices from makers. F. J. Edwards Ltd., 359 Euston Rd., London, N.W.1. Euston 4681. 239-43

Machinery, Tools and Plant (contd.)

PLASTICS MACHINERY
Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.

Send your requirements to the specialists.
REED BROTHERS (ENGINEERING), LTD.,
REPLANT WORKS,
CUBA STREET, MILWALL, E.14.
Phone, East 4081 (five lines). 239-40

36 in. × 23½ in./18½ in. Cracker (fluted rolls) and 42 in. × 16 in. Refiner, both by Francis Shaw, driven from 150 h.p. motor and gearbox. (Can be separated.) 36 in. × 12 in., two 40 in. × 12 in., and 36 in. × 16 in. Rubber Mills, three in line, 1 no motor or drive. 54 in. × 20 in. Iddon 4-Roll Calender, with 90/30 h.p. variable drive. 54 in. × 18 in. Walker 3-Roll Calender, with 75 h.p. drive, 30 in. × 12 in./10 in. 4-Roll Calender by Bridge, with 30/10 h.p. variable drive. 2 in. David Bridge Extruder, with motor drive. Two 24 in. × 24 in. Multi-Platen Hydraulic Presses. One 28 in. × 28 in. John Shaw Multi-Platen Press, 26 in. ram. Two Vertical Jacketed Vulcanising Pans, 4 ft. dia. × 8 ft. 6 in. deep. Two Horizontal Vulcanisers, 5 ft. 10 in. dia. × 30 ft. long. 100 lb. p.s.i.

Various footwear speciality machines, sewing machines, thousands of lasts, and other items of plant applicable to footwear production. Further details, prices, and appointments to view from:
HODSON & CO. (MACHINERY), LTD.
SPRING MILLS,
TOTTINGTON,
NR. BURY, LANCS.
Phone, Tott 123/4. 239-45

SPECIALLY CONSTRUCTED twin-screw extruder-mixer for processing waste thermo-plastics to pellets. Complete with pellet cutter, electrical controller/recorder, spare gearbox. Bargain £450.

Also a 3 in. single screw machine with controller/recorder, spare gearbox, etc., less motor. £275.

Silver spray plant. Guns, large air-receiver, compressor, formula, the lot £75.

Radicon No. 6 gearbox, 50/1 ratio. £30. Box P.3923, care of " Plastics." 239-x9904

MACHINERY, TOOLS AND PLANT WANTED

BLOCKING PRESS wanted suitable for Roll Feeding Foil. Please state price and full details to Box P.392, care of " Plastics." 239-23

INJECTION MOULDING MACHINES required. Condition or size not important. Send details Box P3631, care of " Plastics." 241-5391

EXTRUDER and Vacuum Forming Machines wanted. Send full details. Box P3810, care of " Plastics." 222-145

WANTED URGENTLY Injection Moulding Machine up to 4 oz. capacity in good working order. Write The Master Vending Machine Co. Ltd., 80–82 Wardour St., W.1. 239-35

MOULDS

YOUR DESIGN
OUR DESIGN
MOULDS TO YOUR SATISFACTION
AND OURS.
PRECONOMY CO. LTD., TOOLMAKERS.
Eastfield side, Sutton-in-Ashfield, Notts.
zzz-146

COMPRESSION MOULDS for sale. Production of Household Articles, Smokers' Sundries, Fancy Goods etc. Box P389, care of " Plastics." 243-5440

FOR SALE, mould for Standard Cistern Float and Welding Jig. Box P3912, care of " Plastics." 239-27

INJECTION MOULDS for sale in one lot; 15 moulds and extra tools for production of fancy goods, etc., 3 oz. to 8 oz., for details write or phone. N. Fields, Forest Edge, Ringwood Rd., Ferndown, Dorset. Phone Ferndown 837. 239-37

MOULDS WANTED

MOULDS WANTED. Send details of your surplus or redundant Injection and Compression Moulds. Box P384, care of " Plastics." 243-5439

PATENTS

THE PROPRIETOR of Patent No. 691444 for " Machines for Feeding, Working and Mixing Plastic Material," desires to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2. 239-5

Patents (contd.)

THE PROPRIETORS of British Patent No. 704610 are prepared to sell the patent or to license British manufacturers to work thereunder. It relates to " Improvements in the Production of Moulded Bodies from Mineral Wool and Binding Agents." Address: Boult, Wade & Tennant, 112 Hatton Garden, London, E.C.1. 239-9

THE PROPRIETORS of British Patent No. 669423 for " Anchoring means for the flexible diaphragms of shape-forming devices " will grant Licences or will sell the entire British Patent Rights. Replies to Bromhead & Co., Chartered Patent Agents, 19/23 Ludgate Hill, London, E.C.4. 239-13

THE PROPRIETORS of British Patent No. 707,536 for " Method and Apparatus for continuous production of Absorbent Material having a Basis of Regenerated Cellulose " are prepared to enter into negotiations for the Sale or for the grant of Licences thereunder. Enquiries to be addressed to Carpmaels & Ransford, 24 Southampton Buildings, Chancery Lane, London, W.C.2. 239-15

THE PROPRIETOR of British Patent No. 670074, entitled Improvements in Moulding Machine for Moulding Plastic Articles, offers same for licence or otherwise to ensure its practical working in Great Britain. Enquiries to Singer, Stern & Carlberg, Chrysler Building, New York 17, New York, U.S.A. 239-4

PRODUCTION CAPACITY AVAILABLE

IMMEDIATE Injection Moulding Capacity Available, ½ oz. machines, no tool charges for runs of 100,000. Glastics, 69A Shakespeare Street, Southport, Lancs. 241-5466

CAPACITY OFFERED. Firm with large production orders on hand now has machining, fabrication and assembly capacity available in its tool-room and prototype shops and is able to undertake work of this nature immediately. At present approximately 1,000 hours per week are available, including jig-boring. Limits to A.I.D., A.R.B. or Commercial requirements. Please write to Box P3910, care of " Plastics." 240-5473

PLASTICS (MANCHESTER), LTD.,
BRITAIN'S LEADING STOCKISTS AND DISTRIBUTORS.
SPECIALISTS IN
FABRICATION, INJECTION MOULDING AND ENGRAVING.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and Central 1000. 239-308

REPETITION in Ebonite, Erinoid, etc. Capstan lathe work. Temple St., Rugby. Phone 4059. 247-5388

INJECTION MOULDINGS by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 244-5276

SHORT RUNS A SPECIALITY, LONG RUNS A PLEASURE. Low mould cost and overheads. Injection capacity and technical knowledge at your service. Westminster Plastics, Temple Works, 41 Old Church Rd., Chingford, E.4. Silverthorn 7927. 247-5387

NYLON, POLYSTYRENE AND ACETATE INJECTION MOULDINGS up to 2 oz. Reliable service. Latest-type machines. Keen co-operation on new lines. W. H. Adamson Plastics, Ltd., 39 Hedley St., Maidstone. 244-5468

VISIJAR LABORATORIES, LTD.
THE LEADING CRAFTSMEN IN " PERSPEX."
PROTOTYPE AND REPETITION.
OFFICIAL I.C.I. STOCKISTS " PERSPEX."
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF " FORMICA."
149 LONDON ROAD, CROYDON, SURREY.
Phone, Croydon 8228 (two lines) zzz-133

INJECTION MOULDING CAPACITY. Considerable tool-cost savings based on 23 years' experience. Design advice. Martin's Products Limited, 91–92 Turnmill St., E.C.1. Clerkenwell 6070. 242-5416

VACUUM FORMED PLASTICS. Facilities for design development, fabricating and printing. B. T. Bennett & Co., 449 Alexandra Avenue, Harrow, Middx. Field End 6755. 248-5475

RAW MATERIAL

ALWAYS LARGE STOCKS OF CASEIN
RODS, TUBES AND SHEETS.
PERSPEX
SHEETS UP TO 1 IN. THICK.
CELLULOSE ACETATE
CATALIN RODS.
S.R. (PLASTICS), LTD.,
93 ALDERSGATE STREET, E.C.1.
Phone, Monarch 4686. 245-5323

Raw Material (contd.)

P.V.C. PLASTIC FOAM for disposal. Box P3915, care of " Plastics." 239-32

REGROUND POLYSTYRENE—straight colours, quantities of 400 lbs. per colour for disposal at 1/8d. per lb. Box P3913, care of " Plastics." 239-28

CUEX LTD., can offer all at prices well below current list:—
Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex Ltd., 270 Corporation St., Birmingham. Central 5474. 239-39

FOR DISPOSAL: 2 tons Virgin Khaki and 3 tons Virgin Maroon Polystyrene Pellets. Apply Box P2613, care of " Plastics." 239-38

RAW MATERIAL WANTED

SURPLUS STOCKS of thermosetting and thermoplastic moulding powders wanted. Send details. Box P311, care of " Plastics." zzz-227

ERLANOS, LTD., 93 Aldersgate St., E.C. (Monarch 4686), require Perspex and cellulose offcuts and scrap, clear and coloured; highest prices paid. 241-5177

WANTED, Polythene scrap. Write to Box P221, care of " Plastics." zzz-132

SPOT CASH BUYERS of all thermoplastic injection scrap and redundant virgin lots. Regular collections. WG Plastics, 14 Cambridge Park Mews, Twickenham, Middlesex. Popesgrove 1800. 246-5352

WANTED.—Acetate Sheet offcuts, size .005. Clear and Black. Novelties Unlimited, 395 Hornsey Rd., London, N.19. 240-5437

POLYTHENE SCRAP—regular buyers. Michael S. Stevens Ltd., Keswick Rd., Putney, S.W.15. Vandyke 3345. 239-21

P.V.C. POLYMER Sweepings and Tailings. Large quantities required by manufacturer. Box P393, care of " Plastics." 239-24

HERBERT CONNOR LTD., Buyers of All Plastic Scrap—top prices paid on any terms for Polystyrene, Polythene, Diakon, Perspex, P.V.C., Acetate, in lump, scrap, film, offcuts, ground and reground forms. Please send details and samples to: 120 Beaufort Park, London, N.W.11. 239-31

POLYTHENE WASTE AND OFFCUTS WANTED —top prices paid. Box P3914, care of " Plastics." 239-30

POLYTHENE SCRAP—top prices paid on any terms for any form of polythene scrap in lump, scrap, film, ground or reground. Send offers and details to: Herbert Connor Ltd., 120 Beaufort Park, London, N.W.11. 239-29

BROCKWELL PLASTICS LTD., 50 Hollingbourne Rd., S.E.24, will purchase redundant polyethylene scrap of all kinds. We collect and pay cash on collection. Box P399, care of " Plastics." zzz-148

POLYETHYLENE MOULDING POWDERS, lay-flat tubing and scrap of all kinds wanted against prompt cash payment. Box P398, care of " Plastics." zzz-147

WANTED all types of Polythene Scrap. Send details and samples to: Tyruplex, Ltd., 111 High St., N.W.10. Elgar 2684. 239-36

WE REQUIRE large regular supplies of Nylon Scrap, Shavings, Lumps and Rejects. Box P332, care of " Plastics." 239-34

THERMOPLASTICS SCRAP. We always buy large and small quantities and pay prompt Cash. Send offers to J. W. Nash & Co. Ltd., 27 Beethoven St., W.10. Ladbroke 4655/6/7. 239-33

PLASTIC MATERIALS which are soluble in alcohol, solvents wanted. Details Box P3919, care of " Plastics." x9859

SITUATIONS VACANT

PLASTICS RAW MATERIAL SALES REPRESENTATIVE with experience required covering Northern Area. Preferably resident Lancs/Yorks. Apply R. H. Cole & Co., Ltd., 2 Caxton St., London, S.W.1. 239-16

CHEMIST REQUIRED with experience in the preparation and development of P.V.C. Pastes for Rotary and Slush Moulding, and the inspection of thermoplastic injection moulding materials.

Applicant should also be familiar with finishing processes and capable of assessing samples of paints, lacquers and adhesives, and maintaining quality standards.

Salary will be in accordance with qualifications and experience.

Apply to:—Technical Manager, Rosebud Dolls Ltd., Grove St., Raunds, Northants. 239-20

YOUNG ENGINEER with sound knowledge of Plastic materials and extrusion techniques required for development work in a large and expanding concern. The post will call for initiative and inventive imagination. Apply confidentially giving details of experience and salary required to Box P3911, care of " Plastics." 239-26

Situations Vacant (contd.)

WORKS MANAGER required for small trade toolroom near London. Experience Plastic Moulds essential. Strict disciplinarian. Send full details. Box P395, care of "Plastics." 241-5470

FOREMAN MOULDER required. Small shop near London. Essential fully experienced. Write Box P396, care of "Plastics." 241-5471

TOOL ROOM FOREMAN (working) required. Experience moulds essential. Capable supervisor. Near London. Permanent and progressive position. Write Box P392, care of "Plastics." 241-5472

LEATHERCLOTH CHEMIST. Bernard Wardle (Everflex) Limited have a vacancy in their Laboratory for a Chemist or Technician to investigate problems relating to coated fabrics. Salary will be in accordance with experience. Applications giving full details should be addressed to the Managing Director, Peblig Mills, Caernarvon, North Wales. 239-1

REPRESENTATIVE required for the demonstration and sale of electronic preheating equipment. Candidates should be well educated between the ages of 22–30, able to drive and have a good technical knowledge of compression moulding and electricity or radio. Write in confidence to Radio Heaters Limited, Eastheath Ave., Wokingham, Berkshire. 239-6

LAMINATED PLASTIC MANUFACTURERS require technically sound Process Engineer. Experience of Impregnation, Pressing, Raw Material Specifications, and finished product testing essential. Knowledge of Compression Moulding, Printing Trade, Fibreglass Moulding and Thermoplastic Materials would be an advantage. Progressive position in expanding Company. Ayling Industries Group, Horsham, Sussex. 239-8

A DEVELOPMENT MANAGER
is required in connection with the manufacture of
SYNTHETIC RESIN BONDED LAMINATES

to be responsible for the development of new formulations and the improvement of existing ones, together with the provision of Technical Sales Service. The situation is with a progressive Company situated in the north-west of England.

Applicants, who should have had experience in the development of thermo-setting resin impregnated papers and cloths, should have the personality appropriate for this important managerial position, backed by good academic qualifications. Applications are invited from men in the age group 30–40 years and should be sent, in the first place, to Box Number D51, c/o White's Ltd., 72 Fleet St., E.C.4. 239-12

Situations Vacant (contd.)

ASSISTANT CHEMIST required by London Chemical Co. for technical service and development laboratory. Inter. B.Sc. Standard minimum. Previous experience in the field of paints or plastics advantageous. Age 23 and up. Approximate minimum salary £750 and up. Write Box Z.C.372, Deacon's Advertising, 36 Leadenhall St., E.C.3. 239-11

TECHNICAL SALES PERSONNEL required by large organization. Must be experienced in technical selling of adhesives and have a wide knowledge of adhesive markets, uses, etc. Applicants should be prepared to work anywhere in the United Kingdom and should be fully mobile. This opportunity offers good prospects to the right applicant. Good salary and pension scheme. Write, giving full details of career, the fields of adhesive in which experienced, education, etc., to The Staff Manager, Marley Tile Company Ltd., Riverhead, Sevenoaks. 239-2

TECHNICAL SALES PERSONNEL required by large organization. Must be fully experienced in Modern Tarpaulin materials and have a wide knowledge of markets, uses, selling, distribution, etc. Applicants should be prepared to work anywhere in the United Kingdom and should be fully mobile. This opportunity offers good prospects to the right applicant. Good salary and pension scheme. Write, giving full details of career, experience, education, etc., to the Staff Manager, Marley Tile Company Ltd., Riverhead, Sevenoaks. 239-3

M. & B. PLASTICS LTD., have a vacancy for a Technical/Commercial Assistant (aged 20–26) for their London Office. Preference will be given to candidates with a B.Sc. degree or equivalent qualification. A knowledge of French and some experience in thermoplastics would be a great advantage. Candidates must have completed National Service. Contributory Pension Scheme. Five-day week. Apply initially in writing to the Personnel Officer, May & Baker Ltd., Dagenham, Essex, quoting Reference No. 110. 239-14

TOOLMAKER REQUIRED. Experience moulds essential. Permanent and high rate. Seaforth, 60 Oakhurst Rd., Southend, Essex. 242-5417

DESIGNER-DRAUGHTSMAN required. Experience Injection and Compression Moulds essential. Near London. Details experience and salary Box P388, care of "Plastics." 243-5441

FOREMAN (EXTRUSION) required by reputable progressive company South London area. Good prospects., Write giving brief details, experience to date Box P3920 care of "Plastics." 239-42

Situations Vacant (contd.)

EXPERIENCED Technical Sales Representative required for Vacuum Mouldings, Sheet Fabrications and Glass Reinforced Laminates. Permanent appointment. Excellent prospects. Ability to handle business at highest level essential. Apply: Thermo-Plastics Limited, Luton Road Works, Dunstable, Beds. 239-44

SITUATIONS WANTED

PRODUCTION MANAGER seeks responsible position. Sound experience, knowledge of modern production techniques and management controls. Able plastics technician. Box P3916, care of "Plastics." 239-x9603

ASSISTANT WORKS MANAGER, age 35, wide experience of compression and injection moulding, desires change, preferably London area. Box P3917, care of "Plastics." 239-x9723

TIME RECORDERS

FACTORY TIME RECORDERS. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., Ltd., 157–159 Borough High St., S.E.1. 245-5352

BOOKS AND PUBLICATIONS

THE PROPERTIES AND TESTING OF PLASTICS MATERIALS, by A. E. Lever and J. Rhys. A new book containing in a convenient form all the available information on the physical and chemical properties and methods of testing plastics. Over 1,600 references, a comprehensive glossary of reference abbreviations and an extensive index are to be found in this volume which will serve as a standard work of reference to all who manipulate or use plastics materials, and in particular will be invaluable to research workers, development staffs, inventors and students in the plastics and associated industries. 207 pages. Price 30s. net from booksellers, or 31s. by post from the publishers, Temple Press, Ltd., Bowling Green Lane, London, E.C.1. zzz

PLASTICS, SCIENTIFIC AND TECHNOLOGICAL (3rd Edition), by H. R. Fleck. A recognized standard work on the chemistry and technology of plastics. Illustrated. 400 pages, 40s. net from booksellers, or 41s. 4d. by post from the publishers, Temple Press, Ltd., Bowling Green Lane, London, E.C.1. zzz

LY-BAK LIMITED RUBBER & PLASTICS MANUFACTURERS
THERMOPLASTICS

Cellulose Acetate . Polythene . Polystyrene . Aceto-Butyrate P.V.C. and Co-polymer compounds . Polystyrene/Rubber compounds . "Semlux" Fibreglass products . "Plastiblox" Clicker and Rev Press Boards.

SOUTHERN INDUSTRIES AGENCY
(LONDON SALES OFFICE FOR THE GROUP)
SUITE 52 : 26, CHARING CROSS ROAD
LONDON, W.C.2. Telephone: Covent Garden 2538
" " " 1884

Virgin high acetyl and standard, cellulose acetate moulding powders. We are able to reprocess your redundant stocks and scrap into first class moulding powders. We would be pleased to make you an offer for your scrap. Prompt deliveries of virgin and reconstituted powders.

LET US SOLVE YOUR MATERIAL PROBLEMS—THERMOPLASTICS IS OUR BUSINESS
"LY-BAK PRODUCTS ARE GUARANTEED TO SATISFY"
SAMPLES AND SERVICE AVAILABLE UPON YOUR INSTRUCTION

INJECTION MOULDINGS, Etc. | **FINISHING OF PLASTIC ARTICLES** | **FOR PLASTIC SHEETING, Etc.**

BRONZE PASTE AND BRONZE POWDERS—EXTENSIVE RANGE OF SHADES IN VARYING DEGREES OF FINENESS
ALUMINIUM PASTE AND ALUMINIUM POWDERS—VARIOUS GRADES—BASED ON CERTAIN PLASTICISERS
GOLD, SILVER AND COLOUR STAMPING FOILS ALSO COPPER, SILVER AND COLOURED BRONZE POWDERS
SHADES OR PATTERNS MATCHED — SHADE CARD — OR SAMPLES ON REQUEST — PROMPT DELIVERIES
HOME AND EXPORT ENQUIRIES INVITED

H. G. OAKLEY & CO. LTD. DUROLUSTRE WORKS THE MALTINGS LONDON COLNEY HERTFORDSHIRE
Telephone/Telegrams—BOWMANS GREEN—3233-3234. A.I.D. APPROVED ESTABLISHED 1918

INDEX TO ADVERTISERS

Name	Page
A	
Aeroplastics, Ltd.	103
Aero Research, Ltd.	63
Albright & Wilson (Mfg), Ltd.	105
Aldersley Agencies, Ltd.	106, 107
Algemene Kunstzijde Unie N.V.	45
Arger (Machinery) Ltd.	66
Armstrong Patents Co., Ltd.	142
Arpal (Engineers), Ltd.	143
Artrite Resins, Ltd.	113
Ashdowns, Ltd.	52
Asmidar Plastic Moulding Machines, Ltd.	144
Associated Lead Manufacturers, Ltd.	132
B	
Bakelite, Ltd.	67, 100
Baker Perkins, Ltd.	42
Barber & Duffy, Ltd.	149
Beck Koller & Co. (England), Ltd.	98
Berk, F. W., & Co., Ltd.	65
B.I.P. Chemicals, Ltd.	46, 47
B.I.P. Engineering, Ltd.	92, 93
B.I.P. Tools, Ltd.	84
Birkbys, Ltd.	50
Blackfriars Rotary Cutters, Ltd.	120
Blagden, Victor, & Co., Ltd.	120
B.L.C. (Exports), Ltd.	156
Bone Brothers, Ltd.	70, 71
Box P187	150
Bradley & Turton, Ltd.	62
Brand, Ed., Ltd.	3, 49, 83, 133
Bridge, David, & Co., Ltd.	88, 89
Briggs Bros. (Engineers), Ltd.	136
Bristol Aircraft, Ltd.	23
British Celanese, Ltd.	11, 69, 94
British Electrical Development Association, The	22
British Ermeto Corporation, Ltd.	122
British Geon, Ltd.	Front Cover, 31
British Oxygen Co., Ltd., The	6
British Resin Products, Ltd.	Front Cover, 40, 41
British Titan Products Co., Ltd.	28
Burtonwood Engineering Co., Ltd.	77, 90
BX Plastics, Ltd.	91
BX Plastics, Ltd. (Miltoid Sales Dept.)	151
Byson Appliance Co., Ltd.	154
C	
Castle, John, & Co., Ltd.	154
Cellgrave Co., Ltd.	141
Chemidus Plastics, Ltd.	26
Churchill Instrument Co., Ltd.	138
Clifford Covering Co., Ltd.	7
Cole, R. H., & Co., Ltd.	4
Colt Ventilation, Ltd.	53
Connor, Herbert, Ltd.	156
Courtaulds, Ltd.	74
Coventry Motor & Sundries Co., Ltd.	64
Crystalate, Ltd.	20
D	
Daleman, Richard, Ltd.	153
Dales, Herbert, & Partners	154
Davis Plastics, Ltd.	154
Derby Luminescents, Ltd.	154
De La Rue, Thomas, & Co., Ltd.	57, 149
Distillers Co., Ltd., The	36
Distrene, Ltd.	Front Cover
Dohm, Ltd. (Plastics Division)	127
E	
Edwards, F. J., Ltd.	116
Elco Plastics, Ltd.	117
Elliott, E., Ltd.	109
Elm Plastics, Ltd.	140
Elmatic	148
E.M.B. Co., Ltd.	56
Emery, R. J., & Co.	148
Empire Plastics (Birmingham), Ltd.	150
Erinoid, Ltd.	43
Evans, Frederick W., Ltd.	156
Extrudex, Ltd.	155
F	
Fawcett-Finney, Ltd.	18
Ferguson, James, & Sons, Ltd.	35
Fibreglass, Ltd.	131
Flexigrip, Ltd.	153
Fraser & Glass, Ltd.	97
Freeman Taylor Machines, Ltd.	139
G	
General Celluloid Co., Ltd., The	112
General Electric Co., Ltd., The	68
General Engineering Co. (Radcliffe), Ltd.	59
Genristo, Ltd.	137
Granbull Tool Co., Ltd., The	1
Greenwich Plastics, Ltd.	75
Griffiths, Gilbart, Lloyd & Co., Ltd.	140
Grilon & Plastic Machinery, Ltd.	85
Guest Industrials, Ltd.	112, 155
H	
Haigh, John, & Co., Ltd.	138
Harvey, G. A., & Co. (London), Ltd.	138
Hercules Powder Co., Ltd.	110
High Pressure Components, Ltd.	146
Hodson & Co. (Machinery), Ltd.	156
Holzverzucherungs A.G.	85
Horwitch Smith & Co., Ltd.	115
Hunt & Mitton, Ltd.	142
Hupfield Plastics, Ltd.	118
I	
Imperial Chemical Industries, Ltd., Plastics Division	Inside Front Cover, 48, 96, 104
Industrial Plastics, Ltd.	30
Initial Plastics, Ltd.	114
Injection Moulders, Ltd.	121
Insulation Equipments, Ltd.	73
Insulators, Ltd.	37
Ioco, Ltd.	145
J	
Jobling, James A., & Co., Ltd.	132
Johnson, Matthey & Co., Ltd.	13
K	
Kayser Ellison & Co., Ltd.	86
Kemitype, Ltd.	99
Kent Mouldings	130
Kenure, J. F., Ltd.	133
Ketch Plastics	152
Kleestron, Ltd.	76
L	
Lacrinoid Products, Ltd.	16
Lankro Chemicals, Ltd.	2
Lembo Machine Works, Inc.	27
London & Scandinavian Metallurgical Co., Ltd.	44
Ly-Bak, Ltd.	159
M	
M. & B. Plastics, Ltd.	87
Machine Factory & Foundry, Ltd.	118
Manesty Machines, Ltd.	124
Marshall, C. & C., Ltd.	139
Marshall, C. F., & Son, Ltd.	148
Marston Excelsior, Ltd.	29
Maximar Mouldings, Ltd.	152
May & Baker, Ltd.	55
M.C.M. (Tools), Ltd.	152
Melwood Thermoplastics, Ltd.	128
Mentmore Plastics	61
Mersey White Lead Co., Ltd., The	156
Metal Box Co., Ltd., The	Back Cover
Metalin, Ltd.	135
Metropolitan Plastics, Ltd.	19
Millett, Levens (Engravers), Ltd.	148
Monsanto Chemicals, Ltd.	95
N	
Nash, J. W., & Co., Ltd.	156
Nash, William, Ltd.	34
National Plastics (Sales), Ltd.	102
Negri Bossi & Co.	66
O	
Oakland Metal Co., Ltd.	111
Oakley, H. G., & Co., Ltd.	159
P	
Pascall Engineering Co., Ltd., The	152
Peco Machinery Sales (Westminster), Ltd.	81
Pepco, Ltd.	136
Permali, Ltd.	134
Pfizer, Ltd.	125
Phoenix Rubber Co., Ltd.	116
Piece-Parts & Assemblies	147
Plant Installations, Ltd.	129
Plastic Engineers, Ltd.	135
Plastudy, Ltd.	144
Punfield & Barstow (Mouldings), Ltd.	Inside Back Cover
R	
Radio Heaters, Ltd.	12, 51
Redifon, Ltd.	134
Reliance Trading Co.	152
Resinous Chemicals, Ltd.	108
S	
Sale, H. B., Ltd.	122
Saro Laminated Wood Products, Ltd.	33
Scott Bader & Co., Ltd.	119
Shaw, Francis, & Co., Ltd.	24, 25
Shawinigan, Ltd.	151
Shell Chemical Co., Ltd.	5
S.I.C. Plastics, Ltd.	39
Simmonds Aerocessories, Ltd.	17
Smith, Stanley, & Co.	72
Societa Bustese Prodotti Chimici	137
Spa Plastics	146
Stanley Plastics, Ltd.	141
Steele & Cowlishaw, Ltd.	130
Sterling Moulding Materials, Ltd.	10
Stevens, Michael S., Ltd.	144
Stone, J., & Co. (Deptford), Ltd.	54
Stone-Wallwork, Ltd.	32
Streetly Manufacturing Co., Ltd., The	8, 9
St. Just, Theodore & Co., Ltd.	140
Sturge, John & E., Ltd.	82
Suntex Safety Glass Industries, Ltd.	154
T	
Talbot Tool Co., Ltd., The	126
Telegraph Construction & Maintenance Co., Ltd., The	136
Tenaplas, Ltd.	124
Textile Paper Tube Co., Ltd., The	153
Thermo-Plastics, Ltd.	123
Toolchrome, Ltd.	21
Turner Atherton & Co., Ltd.	150
Turner Brothers Asbestos Co., Ltd.	58
U	
U.K. Plastics, Ltd.	126
United Coke & Chemicals Co., Ltd.	128
Universal Tools, Ltd.	60
Utilex, Ltd.	147
V	
Vacuum Industrial Applications, Ltd.	38
W	
Warbrick (Engineering Specialties), Ltd.	77
Weil, Joseph, & Son, Ltd.	143
Whiffens & Sons, Ltd.	78, 79
Wickman, Ltd.	14, 15
Wiggins Teape & Alex Pirie (Sales), Ltd.	80
Worthing Metalization Co.	150
W.S. Electronics (Extruders), Ltd.	114
X	
Xenit Products, Ltd.	142

EDITORIAL AND BUSINESS NOTICES

"PLASTICS" is published on the second Wednesday in each month in London, England by TEMPLE PRESS LIMITED, and is registered for transmission to Canada and Newfoundland by magazine post. Application for second class matter pending at the Post Office, New York, N.Y.

EDITORIAL, ADVERTISEMENT, AND PUBLISHING OFFICES.—Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, London, Telex." Telex: 2-3039.

BRANCH OFFICES.—Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50 Hertford Street, Coventry. Telephone: Coventry 62464. 1 Brazennose Street, Manchester, 2. Telephone: Deansgate 6114-8. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

EDITORIAL.—All editorial communications and matter must be addressed to the Editor and not to individuals. Drawings or MSS or other material not considered suitable will be returned if stamps are enclosed, but the Editor does not hold himself responsible for the safe keeping or safe return of anything submitted for his consideration. Payment for contributions will be made following publication.

ADVERTISEMENTS.—Whilst every precaution is taken to ensure accurate printing, the publishers will not be responsible for printers' errors, or for errors arising out of telephonic instructions relating to advertisement copy, nor will they be responsible for advertisement blocks destroyed by fire or that are left in their possession for more than one year. Advertisers must in all cases bear the cost of drawings, photographs and/or blocks used in their advertisements. Copy must be supplied without application from the publishers, and current copy and blocks will be repeated if new copy is not received at the time of closing for press. Orders for advertisements are subject to acceptance in writing from the Head Offices. Advertisement copy is subject to the approval of the publishers. All advertisements and contracts are accepted and made upon the express condition that the publishers have the absolute right to refuse to insert copy to which they may object for legal, public or trade reasons, and such refusal of copy shall not be a good ground for advertisers to stop a current contract or to refuse to pay for the same, or for taking action for breach of contract. The advertisers will indemnify the publishers against any damage sustained by them as the result of the inclusion of their advertisements. The publishers, whilst endeavouring to ensure that advertisements shall appear with all possible regularity, will not be held liable for any loss occasioned by the failure of any advertisements to appear from any cause whatever. The acceptance of an order does not confer the right to renew on similar terms. The publishers reserve the right to increase the advertisement rates at any time, or to vary the terms of contract as regards space or frequency of insertion. All orders are accepted on the understanding that any such increase in rate or other amendment may come into immediate operation on all outstanding insertions. In such event, the advertiser has the option of cancelling the balance of contract. Contracts relate to the advertisers' own goods or services, and the space may not be sub-let or disposed of in any way. Conditions which are contained in order forms other than those of the Proprietors and which do not conform to, or are in addition to, the Proprietors' conditions, will not be recognized as binding. Special conditions must be subject to mutual agreement.

SUBSCRIPTIONS AND SUPPLIES.—"Plastics" is obtainable to order from newsagents and bookstalls or by post from the publishers at an annual subscription rate of 36/- (Canada and U.S.A. $5.50), postage included. Shorter periods pro rata. Subscriptions are prepayable.

"Plastics" is obtainable from newsagents and bookstalls abroad through the following agents:—EUROPE—Messageries Dawson (S.A.), Paris; Messageries Hachette et Cie, Paris; W. H. Smith & Son, Paris and Brussels. CANADA—Wm. Dawson, Subscription Service Ltd., Toronto, etc.; Gordon & Gotch, Ltd., Toronto. U.S.A.—Eastern News Co., 306 West 11th St., New York 14, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; W. Dawson & Son (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190, Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.

REMITTANCES.—Postal orders, cheques, etc., should be made payable to TEMPLE PRESS LTD.

COMMUNICATIONS.—All orders, letters and inquiries regarding advertisements, subscriptions, and other business matters should be addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

Published monthly by the Proprietors, TEMPLE PRESS LIMITED, Bowling Green Lane, London, E.C.1, and printed in England by SIR JOSEPH CAUSTON & SONS, LTD., Eastleigh.

... and reflect on the qua

P&B

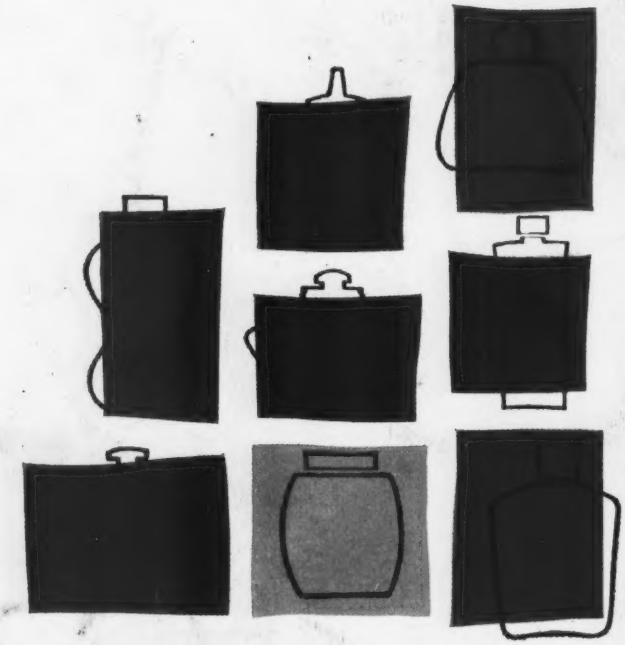
INJECTION MOULDING
Specialists

You will find that our wide exper
in all thermo-plastic materials has
highest quality and dimensional
not get in touch with us today ?

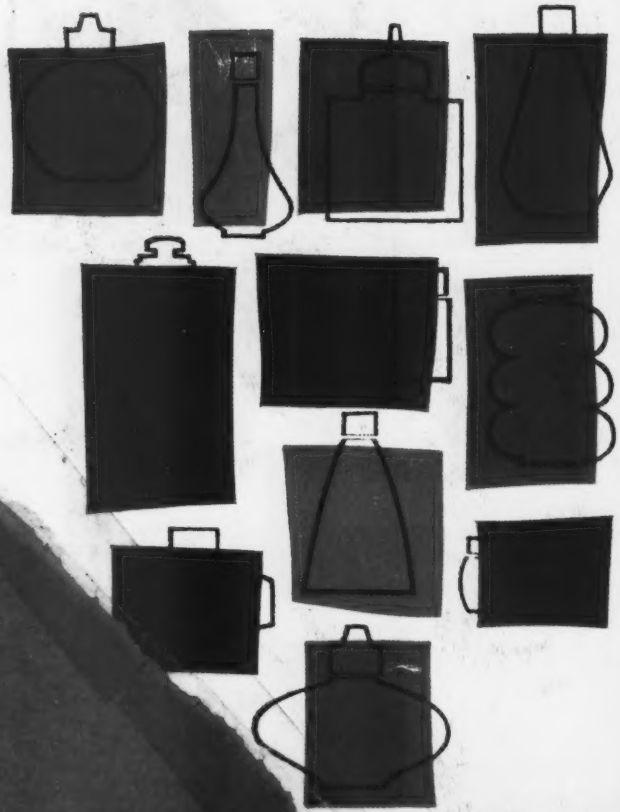
PUNFIELD & BARSTOW (MOULDINGS) LTD., BASIL W
Telephone : COLINDALE 2266/7/8

PUNFI

Vol. XXII. No. 239 **Plastics** AUGUST, 1957

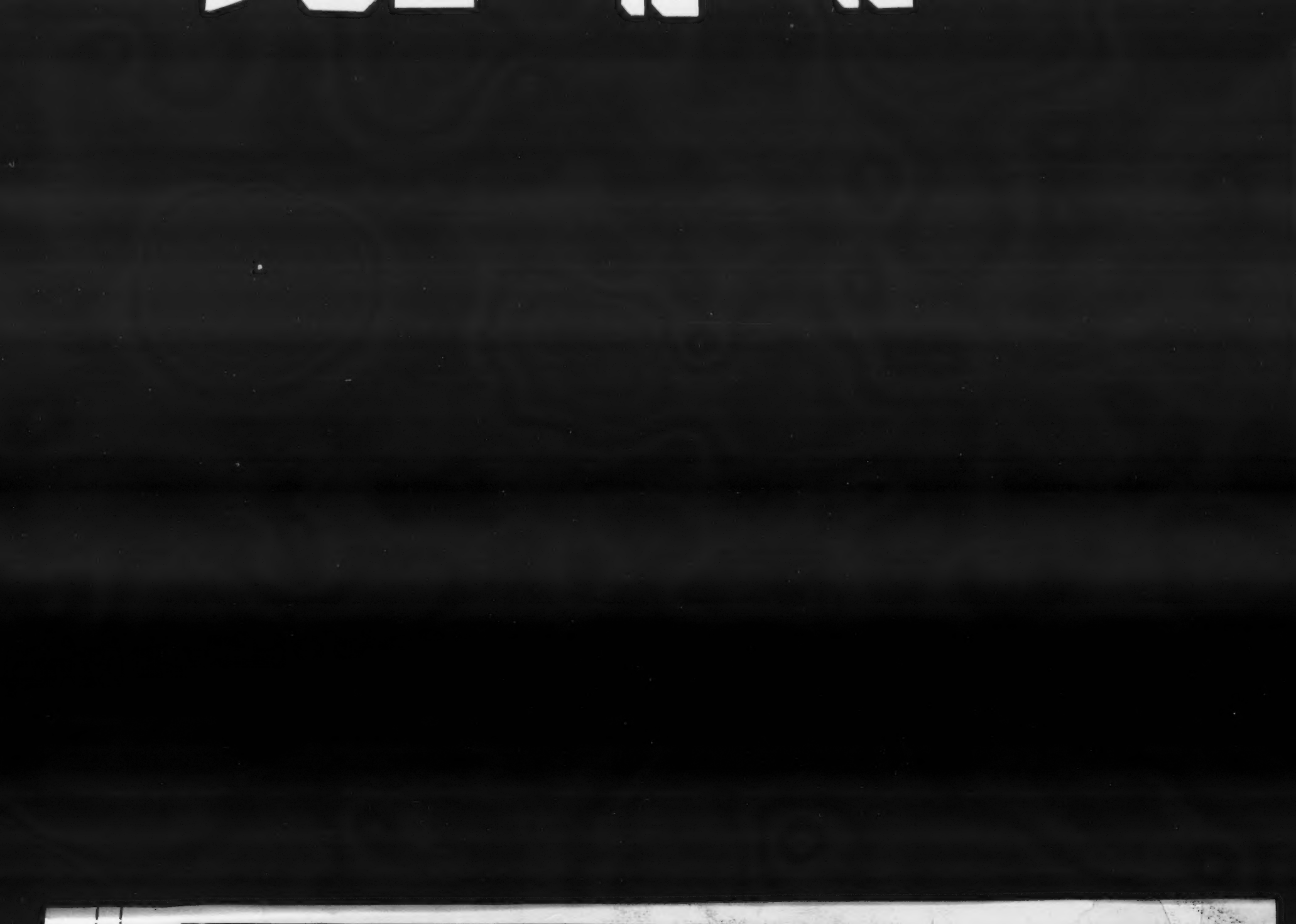


Hold everything!



Wonderful Poly-Tainers, polythene bottles—unbreakable, leak-proof and light-weight give instant 'eye appeal' to your product and rocket your sales. Conventional shapes supplied from stock or containers can be individually designed to suit your requirements. Dispenser attachments to spray, drop, puff or pour your product are available with all Poly-Tainers. Printing is our speciality. Make sure the brand name is genuine 'Poly-Tainer' —it costs no more!

Poly-Tainer

K COMPANY LIMITED
lastics Group
ndon W.1 · lunter 5577

MB 55/01